National Aeronautics and Space Administration

THE CRITICAL PATH

A FLIGHT PROJECTS DIRECTORATE PUBLICATION | 2019 WINTER ISSUE

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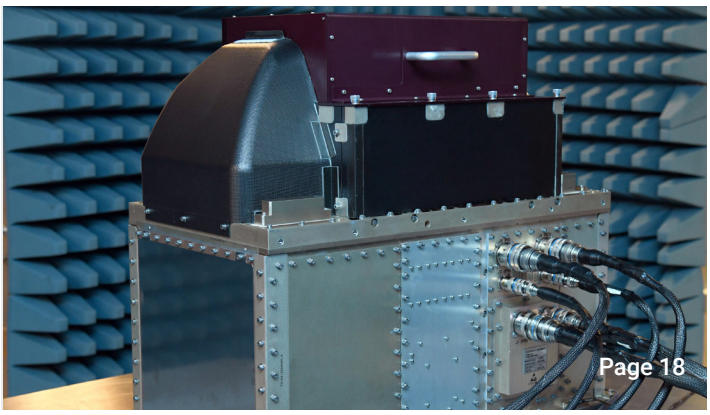
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THE CRITICAL PATH

A FLIGHT PROJECTS DIRECTORATE PUBLICATION • 2019 WINTER ISSUE

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The deadline for the next issue is **March 16, 2020**

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Message from the DIRECTOR

Welcome to another edition of The Critical Path.

As usual, there were a lot of exciting events that occurred in the last quarter as we wrap up 2019. For starters, I was fortunate to be at the Kennedy Space Center with the ICON team for the successful launch of the mission on October 10. Commissioning of the spacecraft has gone extremely well and the mission has now started into its science phase.

Another huge milestone occurred recently with the James Webb Space Telescope's telescope element being successfully mated to the spacecraft. Additionally, the project successfully passed its Key Decision Point-D. Launch from French Guiana is now just over one year away!

Other recent highlights include the successful shipment of the Solar Orbiter observatory to the launch site in Florida, with launch on track for early February 2020; the successful Lucy Critical Design Review; the successful WFIRST Preliminary Design Review; the MOMA mass spectrometer onsite in Europe with the ExoMars rover proceeding through environmental tests prior to its launch in July 2020; XRISM/Resolve hardware shipped to Japan on schedule; and the imminent OSIRIS-REx final site selection in advance of its tag of the asteroid Bennu in August 2020.

Looking ahead, Goddard has embraced the Agency's priority with Artemis (aka "Boots on the Moon in 2024") and we are now actively pursuing supporting roles in the areas of space communication and navigation, science payloads, and in-space servicing. We're not sure yet what our exact role will be on this historic program, but we are excited about the opportunity to play a part in it.

I also want to announce that the results of the annual Employee Viewpoint Survey (EVS) were released. I am very proud of our directorate's results which has us rated with an overall score of 86%, placing the Flight Projects Directorate at the top of all directorates at Goddard. It is a testament to our people, our teams, and the missions we work on that FPD is consistently at the top tier of government for EVS scores. Thanks to all of you!

It is with some sadness that we bid farewell to George Morrow, our acting Center Director, at the end of December. For me personally, George has been much more than my supervisor – he has been a mentor, a friend, and an incredible leader for Goddard and the Agency. George has put his heart and soul into the NASA mission and its people. It has been an honor to work with him. The entire Flight Projects Directorate and I wish George much health and happiness as he begins the next stage of his life.

In conclusion, it is my sincere hope that all of you can take some time off during this upcoming holiday season to relax and enjoy time with family and friends. Thank you for everything you do to make the Flight Projects Directorate a successful and great place to work. Happy holidays! ■

David F. Mitchell
Director, Flight Projects
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A WORD FROM THE DEPUTY

In the Field with Tom McCarthy

Two-part video

Watch Tom in 2 separate videos.

- Part 1: https://youtu.be/0V2vK7ljtHM
- Part 2: https://youtu.be/wtsKSjWl3z0

NASA's Satellite Servicing Projects Division (SSPD) is providing ten specialized tools to assist in the repair and subsequent life extension of the Alpha Magnetic Spectrometer (AMS) instrument aboard the International Space Station (ISS). Johnson Space Center sought SSPD's assistance because of the Division's extensive background providing specialized repair tools, both for the Hubble Space Telescope Servicing Missions, and now for robotic servicing missions. For the AMS Life Extension Mission, space station astronauts are performing Extra Vehicular Activity and using the tools to remove covers and shields, perform the repairs, and replace the parts that were removed. With its capabilities restored, AMS will be able to continue detecting and measuring antimatter in cosmic rays, helping us understand more about the formation of the Universe and search for evidence of dark matter.

FPD Deputy, Tom McCarthy, recently visited the Goddard Satellite Servicing Control Center (GSSCC) to watch SSPD tools in action and discuss the activities with SSPD ISS Projects Lead, Jill McGuire and mechanical engineers Breanne McNerney and Mike Cortina. Astronauts Luca Parmitano and Drew Morgan used SSPD-developed tools to repair the AMS instrument on the exterior of the ISS. ■

LunaNet

Enabling the Solar System Internet

Imagine you are on the surface of the Moon, studying its vast regolith and ancient landscape. 238,855 miles away from Earth, you would likely be full of many emotions: ambition, excitement and probably good a sense of fear. These reactions are experienced by even the most daring adventurers who ascend the towering mountains or plunge into the pitching seas of Earth. These landscapes and the Moon all have something in common: they are unknown, expansive and quite lonely.

What if you could communicate with home while on these daring adventures? It would, at the least, lessen the sense of loneliness and ease your fears. NASA astronauts spend years training before facing the unknown, preparing for their journey and these emotions, so that when they venture out, they are not fearful, but ready. However, they too appreciate a connection back to Earth, whether it be talking to mission control or their families.

Mobile networked communications have transformed our lives on Earth. Mobile users accessing a website or communicating by email or voice need only to open an application and specify the destination (i.e., address or phone number) to invoke the service. The network takes care of the rest.

Since June 2019, a team at Goddard Space Flight Center has championed the revolutionary concept of a robust lunar communications and navigation infrastructure that would bring these capabilities to the Moon. This infrastructure, called LunaNet, has the potential to lead to ground-breaking scientific discoveries.

LunaNet is a flexible communications and navigation architecture that will play a critical role in the Agency's journey to the Moon, Mars and beyond. It is based on linked network assets, or nodes, capable of providing a combination of three standard services: network services, for data transfer between nodes and the end user; positioning, navigation and timing services, for position and velocity determination, time synchronization and astronauts search and rescue location services; and science utilization services, providing situational alerts and science measurements for human and asset safety.

The diverse Goddard LunaNet team leverages many areas of expertise, such as the communications and navigation community, the engineering community and the science community. Goddard is NASA's largest science center. This capability is critical to the successful development and implementation of LunaNet. LunaNet embraces a unique approach to utilizing NASA science data in service to human exploration. By providing astronauts with more direct access to science data, LunaNet would improve astronaut safety and situational awareness. For example, if solar weather, the radiation released from the Sun, rises dramatically, as in the case of a solar flare, LunaNet could advise astronauts to seek shelter with unparalleled speed by providing them direct access to data from space weather instruments on satellites connected to the network.

Due to the architecture's flexibility, LunaNet can be created and sustained by not only NASA, but other government agencies, international agencies, commercial partners and universities. On September 11, 2019, NASA Headquarters and the Space Technology Mission Directorate released a SmallSat Technology Partnerships solicitation entitled, "Space Technology Research, Development, Demonstration, and Infusion 2019 (SpaceTech-REDDI-2019)." In this solicitation, they asked partners to work toward three Agency goals: lunar communications and navigation network (LunaNet), SmallSat propulsion for lunar missions and advanced electrical power subsystem and thermal management technology. This solicitation was the first step in developing strong partnerships for the creation of the LunaNet architecture.

As NASA journeys to the Moon and beyond, creating a sustainable solar system internet becomes increasingly important. Currently, LunaNet is in its beginning stages, but as its development progresses, the world will witness the creation of a terrestrial-like internet on the Moon, connecting assets and astronauts to home. While establishing LunaNet, we can also turn our eyes to the red planet and extend the LunaNet infrastructure to Mars, enabling the solar system internet and further providing the critical link needed for future exploration. ■

Katherine Schauer / Code 450
Technical Writer, Exploration and Space Communications

Caption. CREDIT: ISTOCK

JAMES WEBB REACHES A NEW MILESTONE

Reaching a major milestone, engineers have successfully connected the two halves of NASA's James Webb Space Telescope for the first time at Northrop Grumman's facilities in Redondo Beach, California. Once it reaches space, NASA's most powerful and complex space telescope will explore the cosmos using infrared light, from planets and moons within our solar system to the most distant galaxies.

CREDIT: NORTHROP GRUMMAN

JWST integration at Northrop Grumman in Redondo Beach, CA. CREDIT: NASA / CHRIS GUNN

To combine both halves of Webb, engineers carefully lifted the Webb telescope (which includes the mirrors and science instruments) above the already-combined sunshield and spacecraft using a crane. Team members slowly guided the telescope into place, ensuring that all primary points of contact were perfectly aligned and seated properly.

"The assembly of the telescope and its scientific instruments, sunshield and the spacecraft into one observatory represents an incredible achievement by the entire Webb team," said Bill Ochs, Webb project manager for Goddard Space Flight Center. "This milestone symbolizes the efforts of thousands of dedicated individuals for over more than 20 years across NASA, the European Space Agency (ESA), the Canadian Space Agency (CSA), Northrop Grumman, and the rest of our industrial and academic partners."

Following the successful integration of Webb into its final form, technicians and engineers fully deployed, and tensioned each of its sunshield's five layers, successfully putting the sunshield into the same position and stance it will be in a million miles from Earth.

To observe distant parts of the universe humans have never seen before, the Webb observatory is equipped with an arsenal of revolutionary technologies, making it the most sophisticated and complex space science telescope ever created. Among the most challenging of these technologies is the five-layer sunshield, designed to protect the observatory's mirrors and scientific instruments from light and heat, primarily from the Sun.

As a telescope optimized for infrared light, it is imperative that Webb's optics and sensors remain extremely cold, and its sunshield is key for regulating temperature. Webb requires a successful sunshield deployment on orbit to meet its science goals.

The sunshield separates the observatory into a warm side that always faces the Sun (thermal models show the maximum temperature of the outermost layer is 383 Kelvin or approximately 230 degrees Fahrenheit), and a cold side that always faces deep space (with the coldest layer having a modeled minimum temp of 36 Kelvin, or around minus 394 degrees Fahrenheit). The oxygen present in Earth's atmosphere would freeze solid at the temperatures experienced on the cold side of the sunshield, and an egg could easily be boiled with the heat encountered on the warm end.

Webb has passed other deployment tests during its development. Equally as important were the successful disposition of issues uncovered by those earlier deployments and the

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JWST Sunshield fully deployed. CREDIT: NORTHROP GRUMMAN

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spacecraft element environmental testing. As before, technicians used gravity-offsetting pulleys and weights to simulate the zero-g environment it will experience in space. By carefully monitoring the deployment and tensioning of each individual layer, Webb technicians ensure that once on orbit, they will function flawlessly.

"This was the first time that the sunshield has been deployed and tensioned with the telescope present above it. The deployment is visually stunning as a result, and it was challenging to accomplish," said James Cooper, NASA's Webb telescope sunshield manager at Goddard.

The sunshield consists of five layers of a polymer material called Kapton. Each layer is coated with vapor-deposited aluminum, to reflect the Sun's heat into space. The two hottest Sun-facing layers also have a "doped-silicon" (or treated silicon) coating to protect them from the Sun's intense ultraviolet radiation.

To collect light from some of the first stars and galaxies to have formed after the Big Bang, the telescope needed both the largest mirror ever to be launched into space, and the sunshield that has the wingspan of an entire tennis court. Because of the telescope's size, shape and thermal performance requirements, the sunshield must be both big and complex. But it also has to fit inside a standard 16-foot-(5-meter)-diameter rocket payload fairing, and also reliably deploy into a specific shape, while experiencing the absence of gravity, without error.

Following Webb's successful sunshield test, team members will begin the long process of perfectly folding the sunshield back into its stowed position for flight, which occupies a much smaller space than when it is fully deployed. Then, the observatory will be subjected to comprehensive electrical tests and one more set of mechanical tests that emulate the launch vibration environment, followed by one final deployment and stowing cycle on the ground, before its flight into space.

Webb will be the world's premier space science observatory. It will solve mysteries in our solar system, look beyond to distant worlds around other stars, and probe the mysterious structures and origins of our universe and our place in it. Webb is an international project led by NASA with its partners, ESA and CSA. ■

Thaddeus Cesari / Code 443
JWST Technical Writer

JWST Amazing photos

Chris Gunn, a JWST technical photographer, recently shared some insights into his experiences working for NASA and the JWST project with Hasselblad, manufacturers of the cameras he frequently uses in his award-winning work.

https://www.hasselblad.com/stories/chris-gunn-nasa-james-webb-telescope-hasselblad/

THERE'S A NEW BUILDING ON THE BLOCK!

Instrument Development Facility (IDF) BUILDING 37

Some have asked, "what is that building under construction at the former warehouse site?" In response, Goddard Space Flight Center will soon welcome its newest state-of-the-art facility, known as the Instrument Development Facility or IDF for short. It is Goddard's 37th building.

The IDF is slated for completion next spring (2020). The IDF (B.37) is the first building on a site that will potentially support up to three additional buildings of similar design, and an overall site development plan responsive to the greater campus master plan.

The building is approximately 54,000 gross square feet, spanning two stories and a mechanical equipment penthouse. It will support Code 699 Research Development and Flight. After construction completion and outfitting, Code 699 staff will relocate from Buildings 22, 33 and 34 to occupy the IDF.

Features of the building include: centrally located laboratories designed to maximize long-term flexibility; one ISO-7 (Class 10,000) cleanroom; offices; temporary workspace and teaming spaces, and the typical building support spaces. The immediate site will accommodate 78 parking spaces.

The design of the IDF will ideally achieve Leadership in Energy and Environmental Design (LEED) Gold certification although our required goal is LEED Silver. It will also be a Net Zero Energy capable facility, which means it will balance minimizing energy use and maximizing renewable energy strategies.

The IDF complies with two decadal studies (the National Research Council (NRC) solar system exploration survey, "New Frontiers in the Solar System: An Integrated Exploration Strategy," and the National Academies Press, "Vision and Voyages for Planetary Science in the Decade 2013-2022," published in 2011) which have a stronger focus on the nature and distribution of organic material throughout the solar system. ■

Bill Glenn / Code 400
Mission Support Manager

ICON LAUNCHED!

(Finally!)

OCTOBER 10, 2019
AT 9:59 P.M. EDT

The Ionospheric Connection Explorer (ICON) observatory was dropped from a NGIS Stargazer L-1011 aircraft

With these words from the ICON Launch Director, "Drop on my mark ...3-2-1 Drop," the Northrop Grumman Innovation Systems (NGIS) Pegasus XL launch vehicle carrying the Ionospheric Connection Explorer (ICON) observatory was dropped from a NGIS Stargazer L-1011 aircraft on the night of October 10, 2019 at 9:59 p.m. EDT off the coast of the Cape Canaveral Air Force Station (CCAFS). ICON was finally on its way to explore the dynamic region in space where Earth's weather from below meets space weather from above, the ionosphere!

The ICON launch was a testament to the patience and persistence of the ICON mission team as it had to endure approximately 2 years of launch delays due to issues with the Pegasus XL launch vehicle. Even this successful launch had a couple of obstacles that were eventually overcome. The October 10, 2019 launch occurred on the second attempt that night (on a Pegasus "recycle" attempt). The first launch attempt had been aborted due to a communication issue between the launch operations team at CCAFS and the

Artist's rendering of the ICON spacecraft. CREDIT: NASA

(left) L-1011/Pegasus/ICON after takeoff from VAFB on October 1, 2019; on its ferry flight to CCAFS. (right) ICON team with the Pegasus launch vehicle. CREDIT: NASA/RANDY BEAUDOIN

L-1011 aircraft crew. October 10 was actually the backup day as the original date (October 9) had to be postponed due to unacceptable weather conditions at the Cape.

Another issue surfaced during the launch at the ICON Mission Operations Center (MOC), located at the Space Sciences Laboratory (SSL) at the University of California at Berkeley (UCB). The local power utility (Pacific Gas and Electric) had put in place a plan to cut power to various areas in the San Francisco bay area in preparation for a high wind event. The intent of this plan was to reduce the risk of forest fires due to the possibility of downed power lines. Unfortunately, the UCB MOC was part of the affected areas. The MOC team immediately jumped into action, made the necessary arrangements to ensure that the MOC backup generator was ready, and arranged with the university to have their campus cogeneration plant ready to support the MOC as the primary backup source. This allowed the ICON launch attempt on October 10 to proceed.

However, the issues experienced during launch day this past October were just the final set of obstacles ICON had to overcome in the past couple of years. ICON was initially scheduled to launch from the Reagan Test Site (RTS) located on the Kwajalein Atoll in the Marshall Islands, however, launch readiness dates of July/November/December 2017 and June 2018 were all postponed due to issues with the Pegasus launch vehicle. Another launch attempt occurred in November 2018, but this time from the Cape Canaveral Air Force Station (CCAFS). This launch attempt was scrubbed due to a recurrence of one of the launch vehicle problems. The decision was made to fly the L-1011/Pegasus/ICON back to Vandenberg Air Force Base (VAFB) for further investigation. The October 2019 launch readiness date was determined after a long and detailed anomaly investigation by the launch vehicle team.

Since the aborted attempt of November 2018, the ICON observatory had been removed from the Pegasus launch vehicle in January 2019, placed in a clean tent and remained safely under purge while the launch vehicle team conducted their anomaly investigation. Because of the length of time since completing the last full observatory test (October 2017), the uncertainty of the completion date of the Pegasus anomaly investigation, and the unknown next launch opportunity, the decision was made to perform a Comprehensive Performance Test (CPT) of the observatory in August 2019. The ICON team had anticipated this possibility and had started making preparations months before the actual test took place. Since ICON was located at VAFB, to reduce the risk to the observatory, the CPT was to take place at VAFB. This required that all mechanical and electrical Ground Support Equipment (GSE) needed to support the CPT had to recalibrated/recertified and then shipped to VAFB. The majority of the ICON observatory integration and test team was also reconstituted, consisting primarily of personnel from the spacecraft bus team from NGIS and the mission/instrument/operations team from UCB. The CPT was successfully completed; all spacecraft subsystems and instruments underwent a full extensive test that confirmed that the observatory was still in good health and functioning as expected. Included in the CPT was a test of all actuators, including a successful full deployment of the solar arrays. This CPT confirmed that ICON was ready for the October 2019 launch attempt!

ICON will be the newest addition to NASA's fleet of Heliophysics satellites. The Pegasus XL launch vehicle placed ICON close to its planned circular orbit altitude of 575 kilometers (360 miles) with a 27-degree inclination to the equator. NASA has developed the ICON mission to directly explore that hard-to-reach region in our

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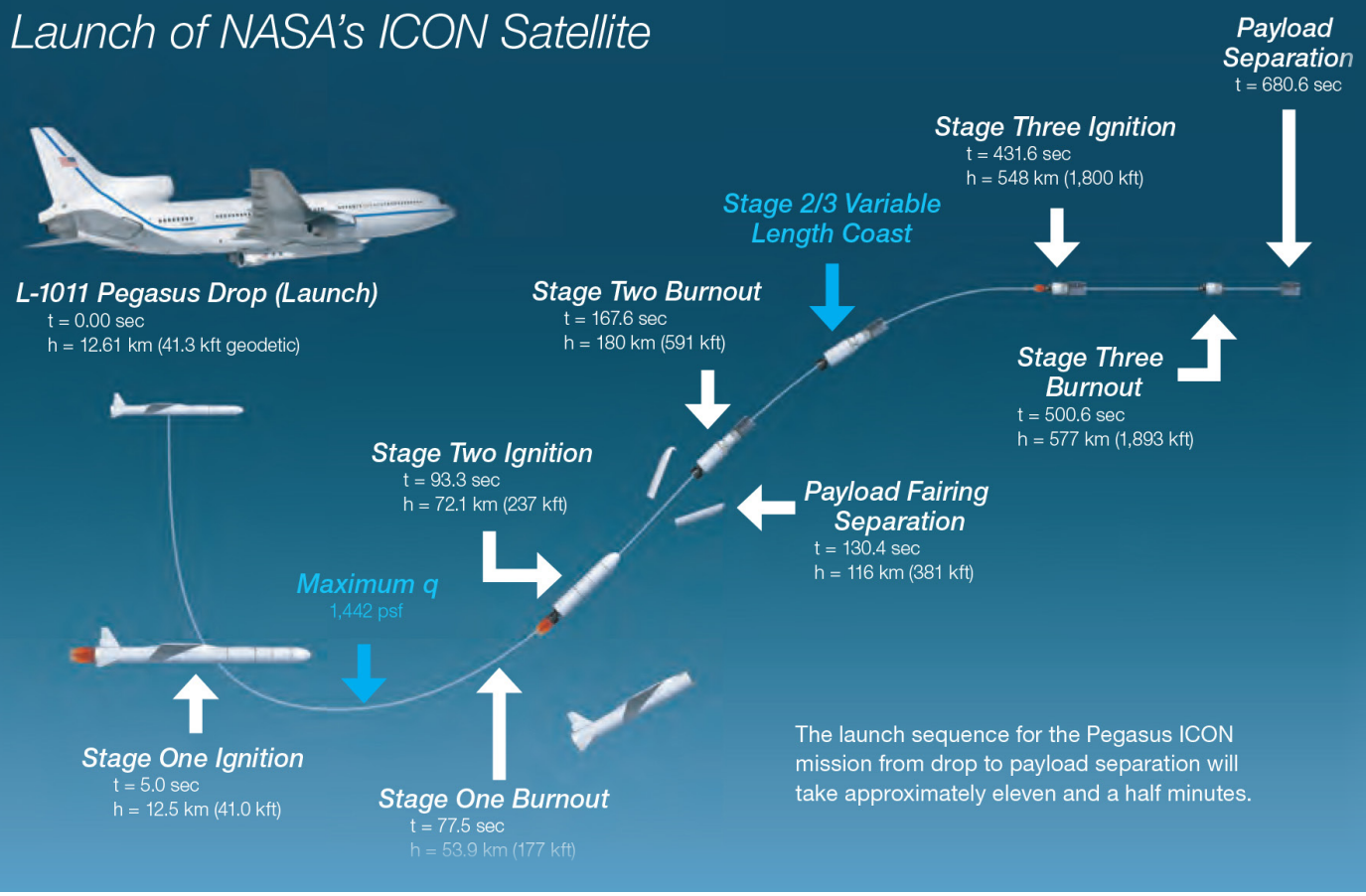

CREDIT: NORTHROP GRUMMAN

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atmosphere, the ionosphere, which despite being close to home, remains mysterious. Here, the tenuous gases that fill Earth's upper atmosphere – a mix of neutral and charged particles – are anything but quiet, as vast, high-altitude winds redistribute them throughout the edge of space. These winds can change on a wide variety of time-scales due to factors including Earth's seasons, the day's heating and cooling, and incoming bursts of radiation from the Sun. The ionosphere and its constant changes have practical repercussions: this is the area through which radio communications and GPS signals travel. Variations here can result in distortions or even complete disruption of signals. Understanding what drives variability in the ionosphere requires a careful look at a complex system driven by both terrestrial and space weather. In order to understand this complicated region of near-Earth space, ICON will explore the connections between the neutral atmosphere and the electrically charged ionosphere with four instruments. Three of the instruments (MIGHTI, FUV and EUV) rely on one of the upper atmosphere's more spectacular phenomena; colorful bands called airglow. Airglow is created by a similar process that creates the Earth's auroras – gas is excited by radiation from the Sun and emits light. Although much fainter than auroras, airglow occurs constantly across the globe. ICON's instruments are designed to capture even the faintest glow to build up a picture of the ionosphere's density, composition and structure. ICON's three airglow instruments view airglow from miles away to measure the temperature, velocity and composition of Earth's atmospheric gases. ICON's fourth instrument (IVM) provides direct measurements of the ionosphere around it; this in-situ instrument will characterize the charged gases immediately surrounding the observatory.

The four ICON instruments are:

Michelson Interferometer for Global High-resolution Thermospheric Imaging (MIGHTI)

The MIGHTI instrument will image the atmosphere to measure the high-altitude winds and temperature variations in the atmosphere-space transition region. These winds and temperature fluctuations are driven by weather patterns closer to the Earth's surface, and in turn, drive the motions of the ionized gases of space. MIGHTI will measure the wind velocity by interpreting the Doppler shift of the atomic oxygen red and

green lines (630.0 nm and 557.7 nm). Temperature is measured from the spectral shape of the molecular oxygen band at 762 nm.

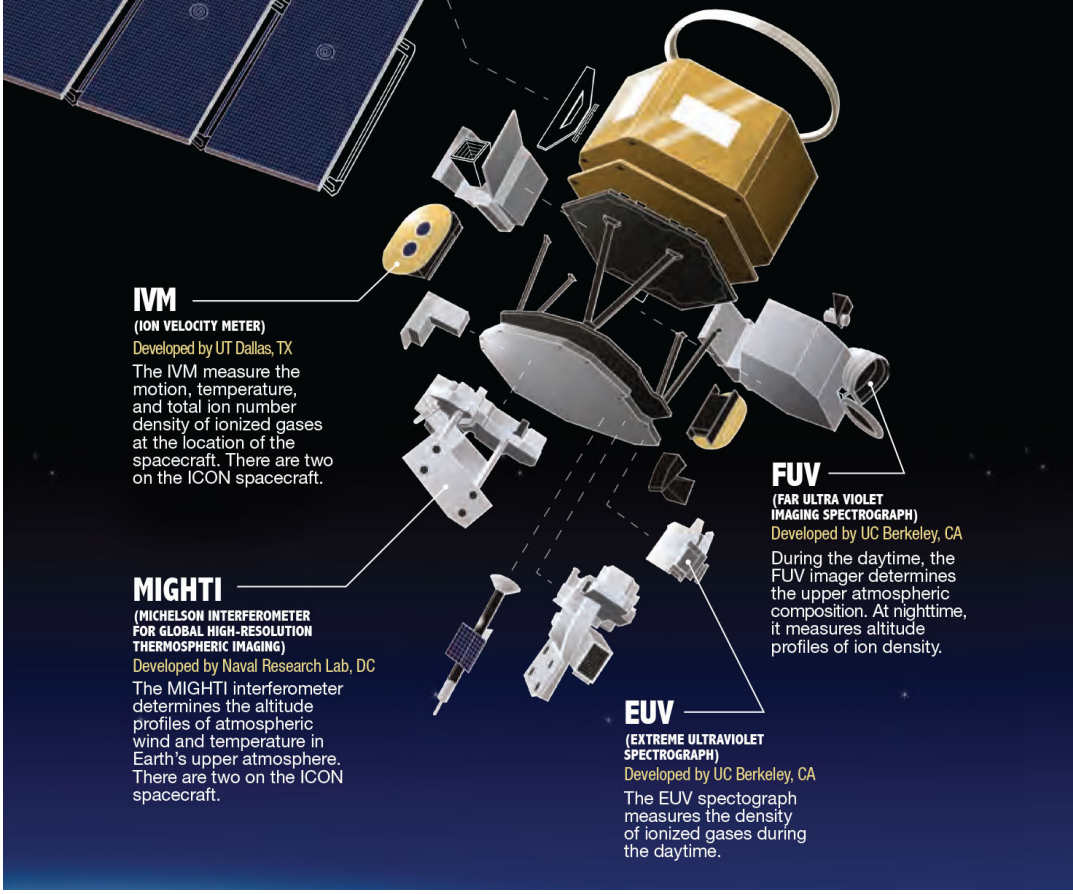
The two identical sensors of the MIGHTI, MTA and MTB, are mounted orthogonally and image the upper thermosphere to provide line of sight Doppler velocity measurements that can be combined to report vector winds versus altitude. A common camera electronics package supports both of the charge control devices (CCDs) imaging cameras used in MTA and MTB. A calibration lamp provides an optical calibration signal to both MTA and MTB via a fiber optic connection. Finally, a stepper motor driver, provided by UCB, is included on each MIGHTI optical assembly. It provides an electrical interface between the MIGHTI aperture actuators and the Instrument Control Package (ICP).

The MIGHTI instrument is one of two ICON instruments that has moving parts used regularly during flight. While the interferometers themselves have no moving parts, there are two apertures in each sensor that are motor-driven. One aperture is at the rear of the baffle (sensor pupil), and the other aperture is an internal Lyot stop. Both apertures are operated simultaneously to provide an aperture reduction to 15% of the full aperture to improve stray light rejection during the dayside of the orbit, when the Earth's disk is many orders of magnitude brighter than the targeted signal in the atmosphere, only 90 km above the bright surface.

The MIGHTI instrument was built and provided by the Naval Research Laboratory (NRL).

Ion Velocity Meter (IVM)

The IVM instruments (IVM-A and IVM-B) will measure the speed of charged particles in response to the push of the high altitude winds and the electric fields they generate. The



CREDIT: MARK BELAN (WWW.ARTSCISTUDIOS.COM)

IVM will determine the electric field perpendicular to the magnetic field, and the ion motion parallel to the magnetic field through measurement of the ion drift velocity vector. Two sensors are part of each of these IVM instruments, the Retarding Potential Analyzer (RPA) and a Drift Meter (DM), which together provide data to determine the total ion concentration, the major ion composition, the ion temperature and the ion velocity in the spacecraft reference frame. The IVMs are mounted on opposite faces of the payload deck, pointed in opposite directions, providing the capability to meet threshold science goals if IVM and MIGHTI work together in either northern or southern-facing modes. Unlike the MIGHTI instrument, only one IVM will be powered and operated at any time in nominal science mode, IVM-A when the other instruments are facing toward the northern hemisphere and IVM-B when they are facing toward the southern hemisphere.

The IVM instruments were built and provided by the University of Texas at Dallas (UTD).

Far Ultra-Violet Imager (FUV)

The FUV instrument takes images of the upper atmosphere in wavelengths of far ultraviolet light. At night, FUV will measure the density of the ionosphere, tracking how the ionosphere responds to weather in the lower atmosphere. During the day, FUV measures changes in the chemical composition of the upper atmosphere, which is the source for the charged gases found higher in space.

FUV is a spectrographic imager that produces two-dimensional images of the scene in its field-of-view at two selected wavelengths, with an approximately 5-nm passband with two separate cameras. The instrument will measure the brightness of both the 135.6-nm emission of oxygen (O) and the Lyman-Birge-Hopfield (LBH) emission of nitrogen (N2) near 157 nm on the limb during the day. This provides the information necessary to determine

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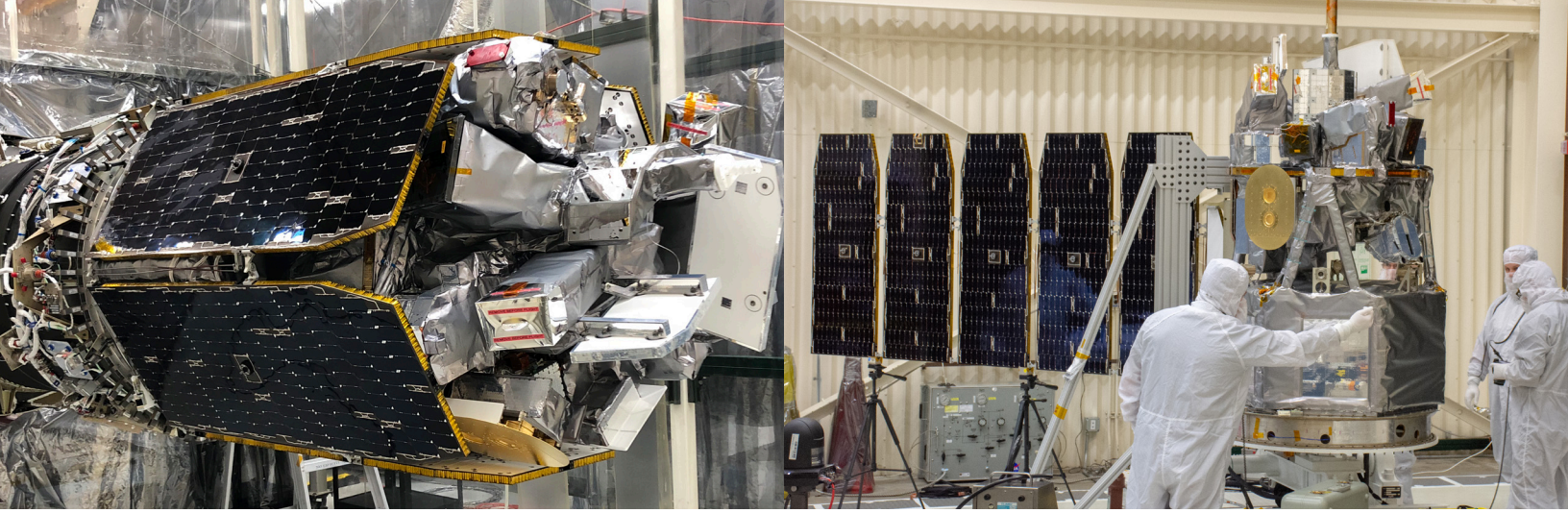


(lef) ICON Observatory fully mated to the Pegasus LV and before Fairing installation at VAFB. (right) ICON Observatory after full deployment of the Solar Arrays during CPT at VAFB. CREDIT: NASA/RANDY BEAUDOIN

Continued from page 15

the daytime thermospheric density profile of the neutral species O and N2 and also provides radiance measurements required to determine the nighttime O+ ion density. Its design makes it completely blind to visible light while having a large aperture for FUV light.

The FUV instrument was built and provided by the UCB.

Extreme Ultra-Violet Spectrometer (EUV)

The EUV instrument captures images of glowing oxygen in the upper atmosphere in order to measure the height and density of the daytime ionosphere, revealing the response of the space environment to weather occurring in the lower atmosphere.

EUV is a single-optic "push-broom" imaging spectrometer that images in the extreme ultraviolet region of the spectrum, with a bandpass that allows it to measure the altitude intensity profile of ionized oxygen emissions (O+ 83.4 nm and 61.7 nm) on the limb in the thermosphere as well as the helium (He) 58.4 nm line. The EUV has an open face Micro-Channel Plate (MCP) that converts incident UV photons into pulses of electrons that are registered on the two-dimensional crossed-delay-line detector.

The EUV instrument was built and provided by the UCB.

Instrument Control Package (ICP)

The ICON instruments are supported by the ICP. The ICP is the main instrument computer that performs all onboard science data processing in addition to providing power to the instruments, controlling all instrument functions, and performing all instrument commanding and telemetry functions. The ICP was built and provided by UCB.

ICON Spacecraft Bus

The ICON spacecraft bus is based on a NGIS-procured LEOStar-2/750 platform. The ICON bus is a three-axis stabilized, zero-momentum bias bus with no consumables that uses a single avionics box called the Master Avionics Unit (MAU) that performs all observatory command and data handling, power management, and attitude control processing functions. The bus contains a five-panel, single wing, single-axis gimbaled solar array. Attitude knowledge is based on a two-camera head unit (CHU) star tracker assembly (STA). A GPS receiver provides ephemeris information. Reaction wheel assemblies (RWA) provide control authority and magnetic torque bars (MTB) unload accumulated momentum. A miniature inertial measurement unit (MIMU) provides rate data during slews and safe mode. Thermal control is implemented as a simple passive system.

The bus supports all science requirements of the mission, meeting needs that include precise and stable pointing, rapid yaw maneuvers and ample battery power for all required observations during nighttime. The observatory operates with no expendable propellants, maintaining attitude with four reaction wheels and three MTBs. Its driving requirement is to implement a specific series of yaw maneuvers in rapid succession, and to settle for science operations soon after the maneuver.

The pointing requirements of the observatory are driven by the scientific performance requirements of the MIGHTI and IVM instruments. Only by maintaining precise control and knowledge of the observatory attitude can those requirements be met. The bus utilizes its star tracker, equipped with two CHUs, to meet these requirements, and can perform with either one of them occulted (i.e., with the Sun near their field of view), or otherwise out of service. This is due in part to the availability of inertial data from the ICON spacecraft's inertial measurement unit that together with the un-occulted CHU can propagate position and pointing knowledge with

ICON team with the Pegasus launch vehicle. CREDIT: NASA

precision and accuracy to meet science requirements through every expected occulted condition.

ICON Mission Operations System

As mentioned above, the Mission Operations Center (MOC) for the mission is located at UCB/SSL. The MOC performs the usual flight observatory operations functions, including commanding and control of ICON and monitoring the health and safety of the observatory. The MOC separates the telemetry data received (health, housekeeping and science) into streams for each instrument which is forwarded to the Science Operations Center (SOC), which is also located at UCB/SSL.

Commissioning Status

Commissioning of the ICON observatory is expected to last until the end of November 2019. At this moment, the spacecraft bus has been fully commissioned with all spacecraft subsystems nominal, all pointing modes checked out and requirements met in all cases. All of the instruments have been powered on with all initial checkouts completed and all operating nominally. Both IVMs have completed initial checkout with IVM-A completing its calibration activities and taking science data in the observatory ram direction. Both MIGHTI interferometers have completed their full checkout and cool-down of their CCDs. Excellent quality fringe images from the atmosphere have been obtained already from both MIGHTI interferometers. The FUV and EUV instruments have both been powered on and are operational. High voltage testing for both FUV and EUV is planned for the latter part of the commissioning flow to allow for flight rules related to the outgassing of the observatory on-orbit to be satisfied.

ICON is the latest of a long-standing line of Heliophysics missions within NASA's Explorers Program Office. NASA Goddard manages the Explorer Program for NASA's Science Mission Directorate. The mission of the Explorers Program is to provide frequent flight opportunities for world-class scientific investigations from space utilizing innovative, streamlined and efficient management approaches within the Heliophysics and Astrophysics science areas. ■

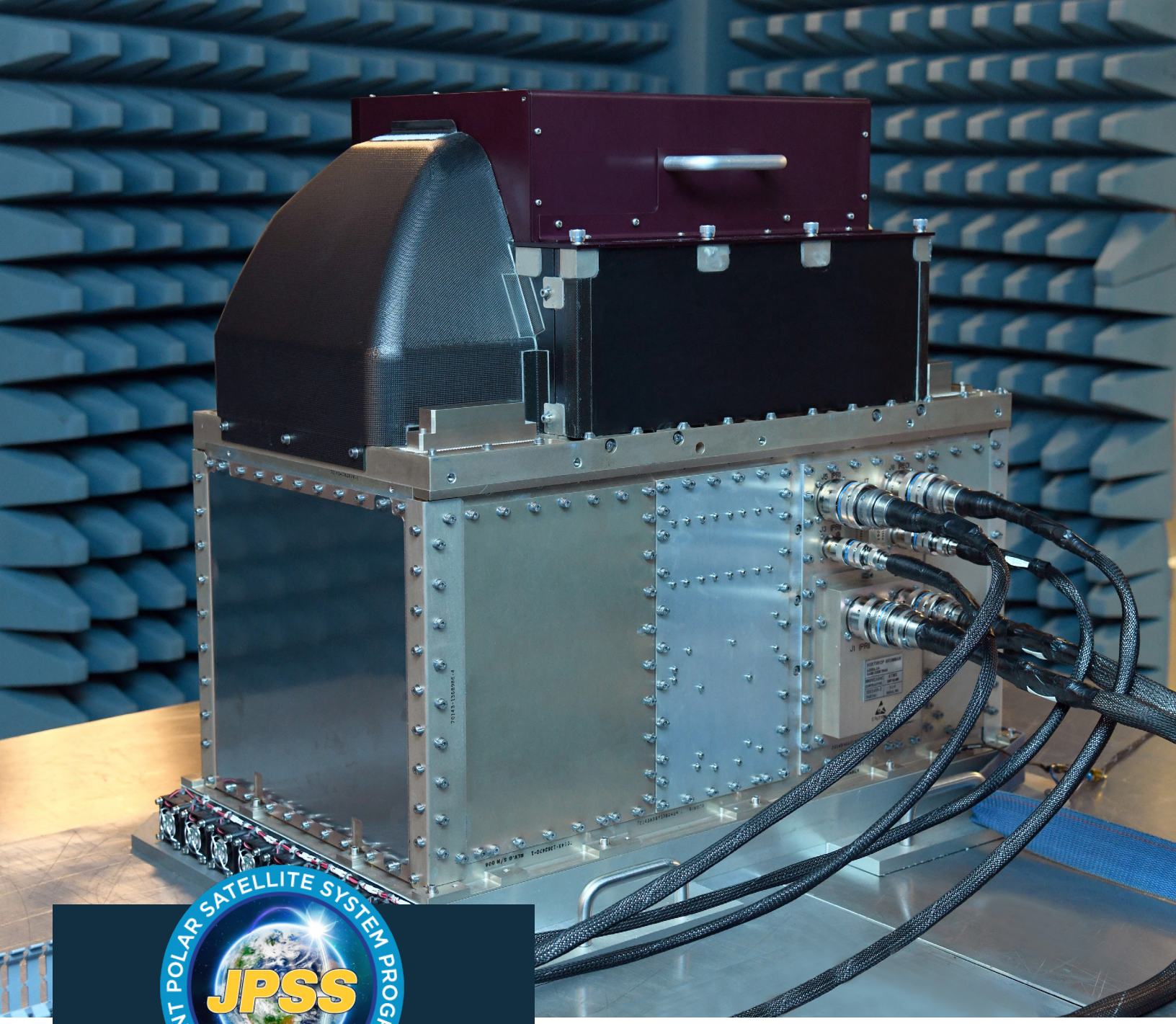
Renan Borelli / Code 460
ICON Mission Manager

ICON
Ionospheric Connection Explorer

More information

Information on the ICON mission:

- https://www.nasa.gov/icon
- https://icon.ssl.berkeley.edu



The Joint Polar Satellite System-2's fully assembled Advanced Technology Microwave Sounder instrument undergoes electromagnetic interference testing at the Northrop Grumman Aerospace Systems facility in Azusa, California.
CREDIT: NORTHROP GRUMMAN AEROSPACE SYSTEMS

Joint Polar Satellite System's Microwave Instrument Fully Assembled

The Advanced Technology Microwave Sounder (ATMS) for the National Oceanic and Atmospheric Administration's (NOAA) Joint Polar Satellite System (JPSS)-2 spacecraft, scheduled to launch in 2022, has been fully assembled and has begun environmental testing.

An artist rendering of the JPSS-2 spacecraft. CREDIT: NASA'S GODDARD SPACE FLIGHT CENTER

A next-generation instrument that detects microwave radiation from the Earth's atmosphere and surface, ATMS provides atmospheric temperature and moisture data that is critical for weather forecasting and global climate trends.

"Data from ATMS instruments on the JPSS satellites – including NOAA-20 and its predecessor Suomi-NPP – have significantly improved the accuracy of U.S. short and medium range weather forecasts," said Greg Mandt, program director for the JPSS Program. "After it is launched in 2022, the JPSS-2 ATMS instrument will be used to ensure continuity for these improvements for years to come."

Northrop Grumman, headquartered in Falls Church, Virginia, is responsible for the manufacturing, test and delivery of the ATMS instrument for JPSS-2. The instrument has been in development since 2016, and environmental testing marks the final step before the instrument gets delivered for integration into the JPSS-2 spacecraft early next year. The rigorous testing will ensure the instrument can successfully withstand launch and the harsh environment of space.

"Every detail matters in ATMS's environmental test campaign. This is the most rigorous, thorough assessment the instrument will see, until it is on orbit," said Bob Mehltretter, vice president, military and civil space, Northrop Grumman. "Our close collaboration with NASA and NOAA throughout the testing ensures that ATMS will provide quality data for our weather forecasts."

Northrop Grumman is also responsible for the design, production and integration of the JPSS-2 spacecraft. The satellite is under construction at the company's Gilbert, Arizona, satellite manufacturing facility.

ATMS currently flies on the NOAA-20 and Suomi National Polar-orbiting Partnership satellite missions. JPSS-2 will become NOAA-21 upon successful launch and on-orbit check-out.

The Joint Polar Satellite System is the nation's advanced series of polar-orbiting environmental satellites. JPSS represents significant technological and scientific advancements in observations used for severe weather prediction and environmental monitoring. These data are critical to the timeliness and accuracy of forecasts three to seven days in advance of a severe weather event. JPSS is a collaborative effort between NOAA and NASA.

NOAA's National Weather Service uses JPSS data as critical input for numerical forecast models, providing the basis for mid-range forecasts. These forecasts enable emergency managers to make timely decisions to protect American lives and property, including early warnings and evacuations. ■

Ashley Hume / Code 470
Strategic Communications and STEM Engagement Lead, Joint Polar Satellite System Program

PACE

Plankton, Aerosol, Cloud, ocean Ecosystem

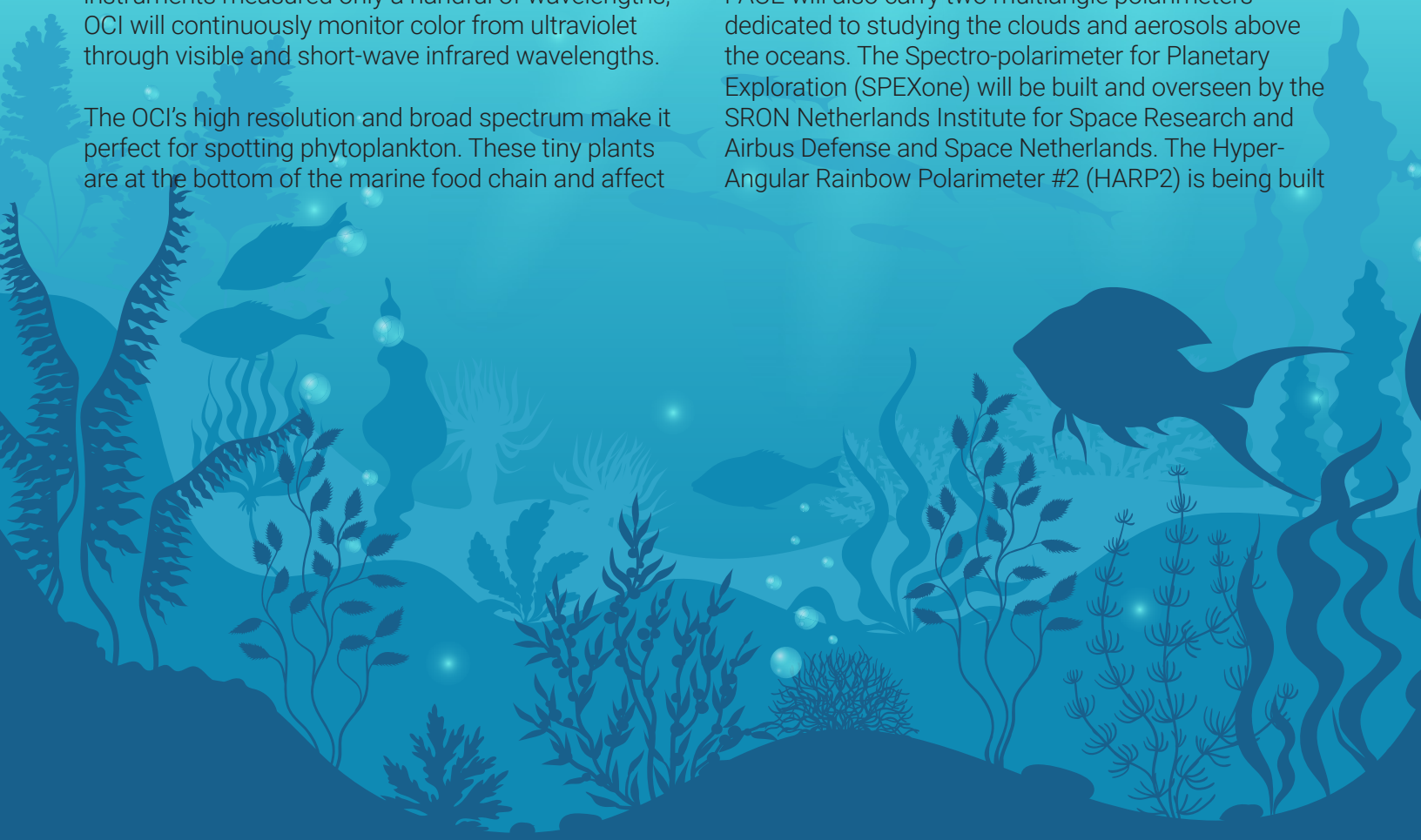
GSFC's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission successfully proceeded to Phase C, its critical design phase, in August 2019. The project reached this critical milestone after overcoming significant challenges during its formulation phase.

PACE will study phytoplankton — microscopic plants and algae that live in the ocean — as well as the clouds and atmospheric aerosol particles above the water.

GSFC is building the mission's primary instrument, the Ocean Color Instrument (OCI). OCI is a hyperspectral scanning radiometer that measures the intensities of the colors of light reflected back from the ocean and atmosphere. Whereas previous Earth-observing satellite instruments measured only a handful of wavelengths, OCI will continuously monitor color from ultraviolet through visible and short-wave infrared wavelengths.

The OCI's high resolution and broad spectrum make it perfect for spotting phytoplankton. These tiny plants are at the bottom of the marine food chain and affect the health of the ocean ecosystem in a variety of ways. Some species provide food for sea life from fish to whales. Toxic species of phytoplankton can multiply into harmful algal blooms (HABs) that contaminate water, sicken animals and people, and harm coastal tourism and economies. And after a bloom, the bacteria that consume the dead phytoplankton can deplete the oxygen in the water, leading to "dead zones." With OCI, scientists will be able to distinguish individual communities of phytoplankton from space with more fidelity and detail than ever before. And with PACE's two-day coverage of the globe, they will be able to track changes in phytoplankton populations across the Earth's ocean over short timeframes.

PACE will also carry two multiangle polarimeters dedicated to studying the clouds and aerosols above the oceans. The Spectro-polarimeter for Planetary Exploration (SPEXone) will be built and overseen by the SRON Netherlands Institute for Space Research and Airbus Defense and Space Netherlands. The Hyper-Angular Rainbow Polarimeter #2 (HARP2) is being built



PACE's completion of Key Decision Point C means its budgets and plans are approved by NASA. CREDIT: NASA / WALT FEIMER

by the Earth and Space Institute at the University of Maryland, Baltimore County. Polarimeters measure the ways that molecules and particles change the oscillation of light waves that pass through them, providing information about particle size and composition. Because the reflection, absorption and scattering of light in the atmosphere is a key part of the balance between incoming and outgoing energy — impacting Earth's temperature and climate change — these instruments will help scientists measure and understand the role of atmospheres and ocean ecosystems in Earth's global processes.

From the start, PACE faced additional complexity as NASA'S first design-to-cost (DTC) directed mission. The team proactively developed numerous methods to communicate and build commitment and understanding for the DTC concept, along with the challenges of meeting DTC during formulation.

PACE was also excluded from the President's budget multiple times. NASA, GSFC, and the project team continued working diligently with Congress to maintain support for the mission and its critical science, resulting in its continuance in annual appropriations bills. Mission continuity concerns can often lead to high staff turnover, but the PACE team maintained a united front with most of its original staff still on board today. This accomplishment was commended by the Standing Review Board at the mission's preliminary design review (PDR).

The team developed a number of impressive products to demonstrate the importance of the mission's science objectives. One standout product was a four-part series of mini-stop animation films. The films (https://svs.gsfc.nasa.gov/12696), describe and define phytoplankton, aerosols, the red tide, etc. in lighthearted, approachable ways. The project plans to develop similar products throughout implementation as well.

The team also smoothly navigated the Government shutdown in December 2018 through January 2019, which could have had extremely negative impacts on the project and its teams. Within 2 weeks of returning to work, the team completed its initial impact assessment, with the final detailed assessment within 3 percent of the initial estimate. The financial and schedule teams were called to perform a re-baseline for the mission, after spending five months completing its initial baseline. These efforts were further accelerated to meet the new June 2019 PDR and August 2019 confirmation review dates. While the schedule was redefined, the team worked with the technical team to establish a new budget for each of the mission elements. Given that the schedule had been lengthened, the budget was also increased. The PDR and confirmation review were very successful. The project has already worked through all requests for action and have made significant progress during the start of implementation.

Every mission goes through a rigorous review process on its journey from concept to launch, but PACE was able to complete these activities while working through these additional challenges. Now that the mission has reached Phase C, NASA leadership has further confirmed its dedication to PACE's critical science objectives and is confident the mission will successfully proceed to launch. ■

Rachel Brinson / Code 420
ESPD Senior Technical Writer

Watch the videos

The videos describe and define phytoplankton, aerosols, the red tide, etc. in lighthearted, approachable ways.

https://svs.gsfc.nasa.gov/12696

Landsat 9 project scientist Jeff Masek describes the L9 mission. CREDIT: NASA

Landsat 9 Friends and Family Day

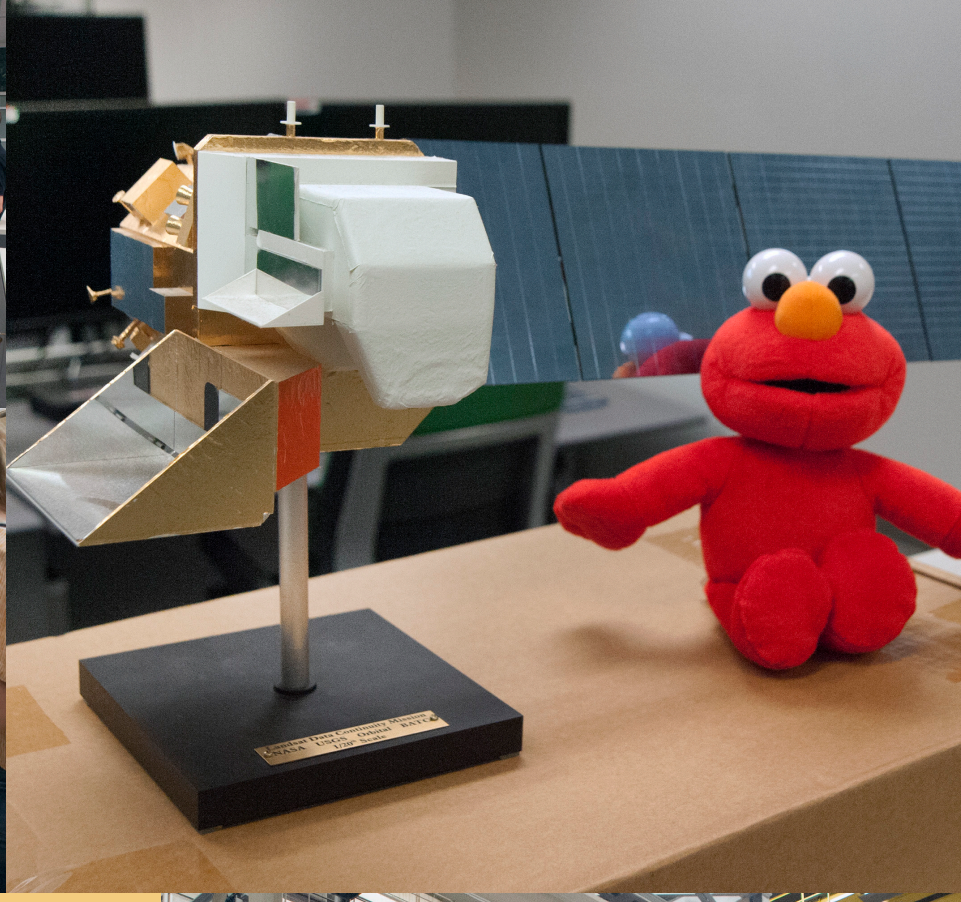
Landsat 9 hosted 250 friends and family at NASA Goddard Visitor Center on Saturday, July 13, 2019. Goddard manages the Landsat 9 project and built one of the instruments. The project invited their friends and family for a closer look at the mission. Landsat 9 is a joint mission between NASA and the U.S. Geological Survey.

Del Jenstrom, Landsat 9 project manager and Landsat 9 project scientist Jeff Masek kicked off the day with an overview presentation. Since the first Landsat satellite launched in 1972, the mission has collected land data, generating the longest continuous record of its kind. Decision-makers from across the globe use freely available Landsat data to learn about environmental change, manage agricultural practices, allocate scarce water resources, and respond to natural disasters.

The satellite will carry two instruments: the Operational Land Imager 2 (OLI-2), built by Ball Aerospace, and the Thermal Infrared Sensor 2 (TIRS-2), built by Goddard.

After the presentations, attendees boarded buses for a behind-the-scenes tour of Goddard. The first stop was the building 7/10/29 complex. Visitors met Patrick Lynch, Goddard Office of Communications specialist, who gave them a tour of the environmental test facilities. Visitors also met instrument project manager Jason Hair and instrument deputy project manager Melody Djam in front of a TIRS-2 exhibit. Attendees got to peek at the TIRS-2 inside the building 7 cleanroom.

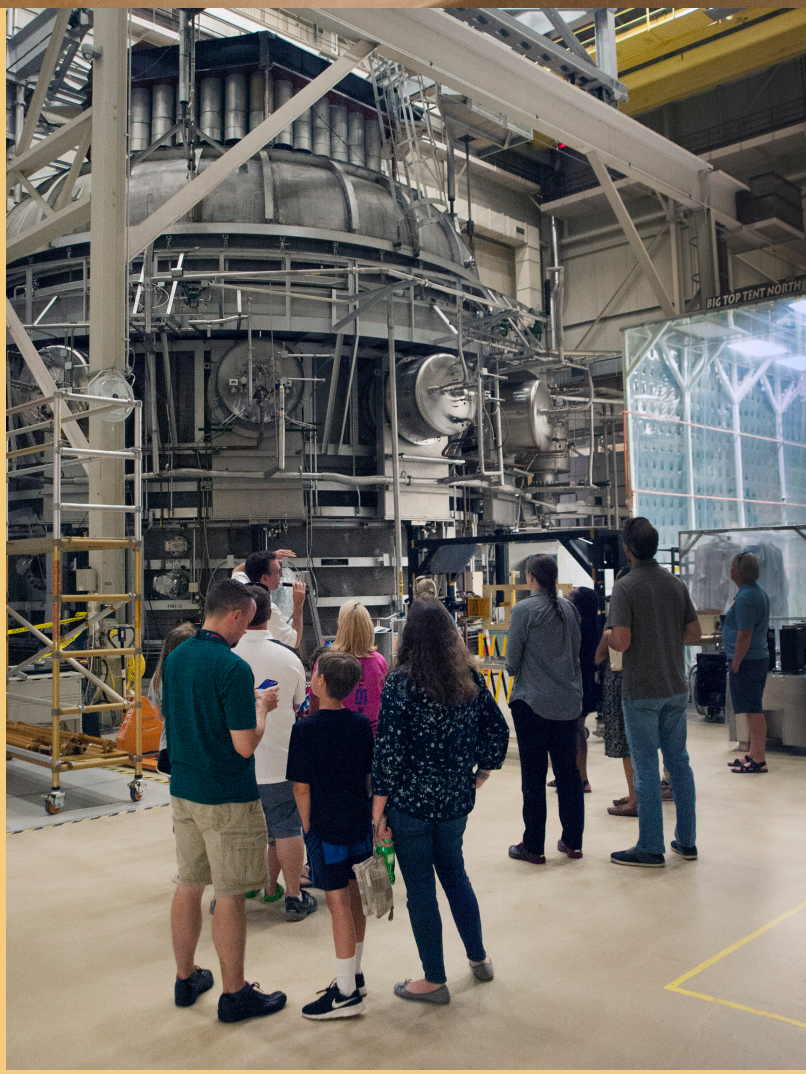
The last stop was at the Landsat Multi-mission Operations Center (LMOC) in Building 32. Visitors met Justin Gronert, USGS LMOC systems engineer, and Grant Mah, the systems engineering manager for USGS ground systems. They learned about the Landsat Multi-mission Operations Element (LMOE), affectionately known as Elmo. The LMOE will integrate flight and ground operations for both Landsat 8 and 9. Afterward, guests were treated to light refreshments and participated in discussions and activities in the building's lobby.



Landsat 9 visitors enjoyed a behind-the-scenes tour of Goddard.
CREDIT: NASA

The Landsat 9 Friends and Family event was sponsored by the Goddard Office of Communications, Earth Sciences Division, the Landsat 9 project office, and Landsat 9 partners; the U.S. Geological Survey's Center for Earth Resources Observation and Science (EROS) and Ball Aerospace. Landsat 9 is grateful for all the help provided by the volunteers who staffed this event and Goddard's Transportation and Security offices, making the Landsat 9 Friends and Family Day a big success. ■

Rani C. Gran / Code 420
Earth Science Communications,
Office of Communications



Federal Acquisition Certification for

Program/Project Managers (FAC-P/PM) Certifications

In April 2007, the Office of Management and Budget (OMB) announced new certification requirements, known as the Federal Acquisition Certification for Program and Project Managers (FAC-P/PM), for all civilian-agency project managers. To meet the FAC-P/PM requirements, NASA is required to certify existing and potential (future) program or project managers who are managing major acquisitions with lifecycle costs greater than $250 million (per NPR 7120.5 definition). NASA is also required to monitor and record continuous learning achievements of certified program and project managers.

CONGRATULATIONS!

Dan Blackwood
Susan Breon
Gyanesh Chander
Gerrit Everson (WFF)
Barbara Grofic
Joy Henegar-Leon
Andrew Peddie
Giovanni Rosanova (WFF)
Azita Valinia
David Wilcox (WFF)

FAC-P/PM Certification

Additional details on FAC-P/PM certification.

https://fpd400.gsfc.nasa.gov/sites/400/FPD_Internal/SitePages/PM_Certification.aspx

GSFC POCs on anything related to P/PM Certification

P/PM CHAMPION:
Cathy Peddie
catherine.l.peddie@nasa.gov
301.286.6826

GENERAL P/PM QUESTIONS:
Leslie Watzin
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301.286.9094

SATERN RELATED QUESTIONS:
Raja Hussain
raja.s.hussain@nasa.gov
301.286.5872

Recipients are shown above (clockwise from top left) Dan Blackwood, Susan Breon, Gyanesh Chander, Barbara Grofic, Joy Henegar-Leon, Andrew Peddie, Azita Valinia. Gerrit Everson (WFF), Giovanni Rosanova (WFF), David Wilcox (WFF) not shown.

Unconscious bias – social stereotypes about certain groups of people that individuals form outside their own conscious awareness – is a fact and despite all our training across the organization, it still occurs. This year, the Flight Projects Diversity & Inclusion (D&I) Committee worked to take one small step toward raising awareness and understanding of this concept, sharing what we learned and sparking conversation throughout the community with a large-scale marketing effort and a budget of zero. How did this happen and was it a success?

A communication effort like this requires buy-in from leadership. Volunteers from the D&I Committee, and support from the Directorate, presented the idea to Center management and to the D&I volunteer team. This campaign was going to make people talk so we wanted to be sure it would not cause concern or disturb any protocol efforts, as this was meant to inspire inclusion versus establish division. It also required support from our colleagues in the Office of Communication to get the e-mail blasters edited and distributed. Committee members partnered with facility operations managers to discuss feedback throughout the campaign. The first blitz involved a lot of planning and volunteering of personal time by committee members, who put up flyers and posters during nights and weekends. Every building at the Greenbelt location was touched during this initiative. After the first value, based on feedback, we evaluated and adjusted before planning the next round. This was a team effort and all actions were impactful.

A values-based approach was chosen as a way of talking about things we can all get behind as individuals looking to build the future. To avoid unconscious bias, we must be open-minded, informed, courageous, and self-aware. Each of these words was intentionally selected to spark conversation about what we understand, define, and value in each other. The campaign was designed to take the community through the stages of a conversation. First, walking into a conversation with an open mind. Then, gaining information so you can be courageous and share your ideas. Lastly, understanding how your words and actions impact others.

Are you close-minded? Be open-minded.

Being open-minded is a choice you make when you enter into a conversation, read an article, watch the news, or engage in other methods of receiving data.

D&I committee members (left to right): Rachel Brinson, Rob Montgomery, Heidi Wood, Emily Roth, Reese Patillo, Celina Hanewich, Tara Dulaney, Donna Swann. D&I committee members that played critical roles in this year's initiative that are not in the picture above: Jen Poston, Shannon Smith, Matt Ritsko, Alicia Jose, Wanda Peters, Leslie Ambrose, Kadie Esi, Jen Brill, and Barb Haskell. Thanks to all for a great year! CREDIT: NASA

You are participating in that activity with preconceived thoughts about the person giving the information, the subject matter, the delivery method, the location and other nuances. Understanding where you are coming from allows you to be more open-minded to new or contrary ideas and in teams it embraces differences and facilitates inclusiveness, making everyone feel valued.

Are you groundless? Be informed.

Building on being open-minded, being informed enables you to understand new ideas and ask intelligent questions. You join conversations with previous knowledge while choosing to learn more, becoming more knowledgeable. Through advance preparation and in your approach to gaining knowledge through conversation, diverse and inclusive discussions help promote growth of both information and understanding. You move from being groundless in your disagreements to reaching new heights through shared information. When the Goddard community makes informed decisions, we reduce risk, bravely innovate, and launch missions successfully.

Are you fearful? Be courageous.

Being courageous at work means you take what you have heard from various viewpoints, as well as the research you perform, to share and act upon at NASA's Goddard Space Flight Center. As we celebrated the 50th anniversary of the first Moon landing, and as we continue to move forward with human exploration of the Moon and Mars, we reflect on the courageous ideas and actions that came before us. We can all learn from them and shape our future based on the bold choices we make today.

Are you unaware? Be self-aware.

Being self-aware reminds us to take time to reflect within ourselves, allowing for a clear perception of our personality, including strengths, weaknesses, thoughts, beliefs, motivation and emotions. Through this understanding, we can become a better team member and better contribute, understanding the effects our contributions have on others. This value was released to coincide with the government mid-year reviews and the closing of the year for many contractor performance reviews, thus encouraging people to reflect on what they did well and how they can do better.

Continued on page 28

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In the end...

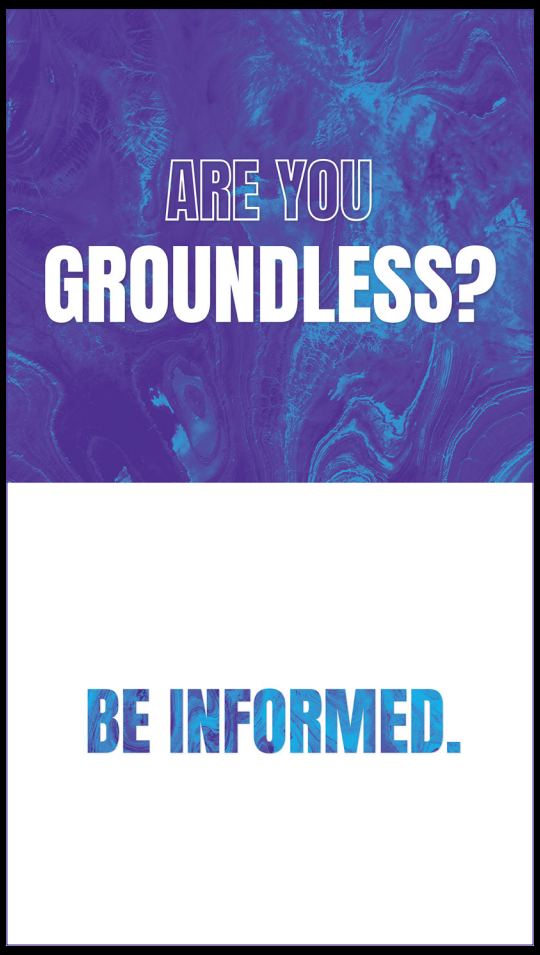
Addressing these common values as an organization builds a common bond and a foundation for a better community. We can work to recognize our biases and better understand how they are affecting our choices. We can be brave and act undauntedly with this information to allow innovation to flourish. The result is empowered employees who openly share their diverse perspectives, helping NASA reach new heights.

As NASA works to take the next man and first woman to the Moon, it will take an innovative and inclusive Goddard community to pursue all areas of science, engineering, business, and support to make the dreams of yesterday and hopes of today the reality of tomorrow. We couldn't have done this without support – we thank our leaders, colleagues and the community for allowing this to happen. It was a different idea that was embraced with enthusiasm. In the end, the communication effort prompted over 1,500 clicks from within the Goddard community. That means that unconscious bias was thought about at least 1,500 times which is pretty incredible! During this time, we learned more about ourselves and each other. More about teams and empowering them. We learned that together, through diversity of thoughts, backgrounds, experiences, and abilities, in an inclusive center, we can all contribute to mission success. We think that is more than one small step – it is more like one giant leap for our organization! ■

The campaign and resources remains as a resource online at: http://bit.ly/fpdvalues.

Tara Dulaney / Code 450
On behalf of the FP D&I Committee

THE FULL CAMPAIGN ARTWORK



How the Visually impaired Experience Hubble Images

Caption. CREDIT: NASA

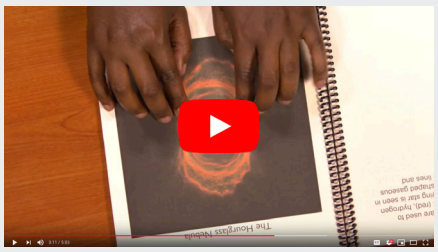
To spread awareness of World Sight Day (Oct. 10, 2019), Goddard's Denna Lambert "feels" the universe through touch. Spectacular Hubble Space Telescope photos are brought to life for the visually impaired.

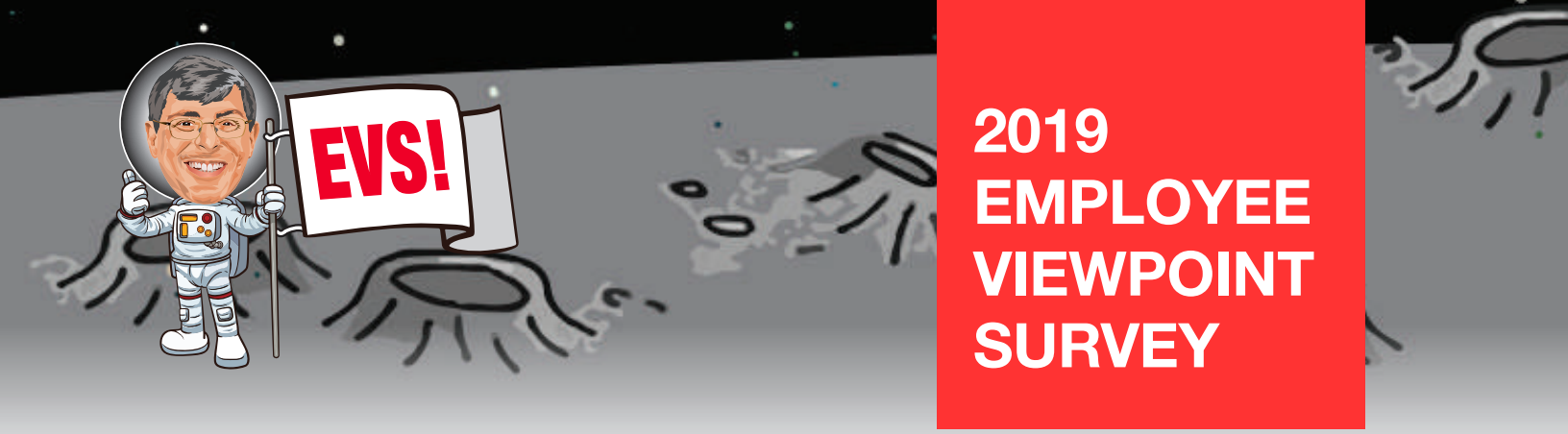
CREDIT:
NASA's Goddard Space Flight Center
Rebecca Roth: Lead Producer
Courtney Lee: Lead Producer
Paul R. Morris (USRA): Producer / Editor
Rob Andreoli: Videographer
John Caldwell: Videographer
Bradley Hague: Videographer

MUSIC CREDITS:
"Hercules' by Christian Ort [GEMA], Matthew Tasa [GEMA], Meyer Anthony [GEMA], Siulapwa Cisha [BMI]; Universal Production Music

Watch the video

- https://youtu.be/SXi0AOMl33E





2019 EMPLOYEE VIEWPOINT SURVEY

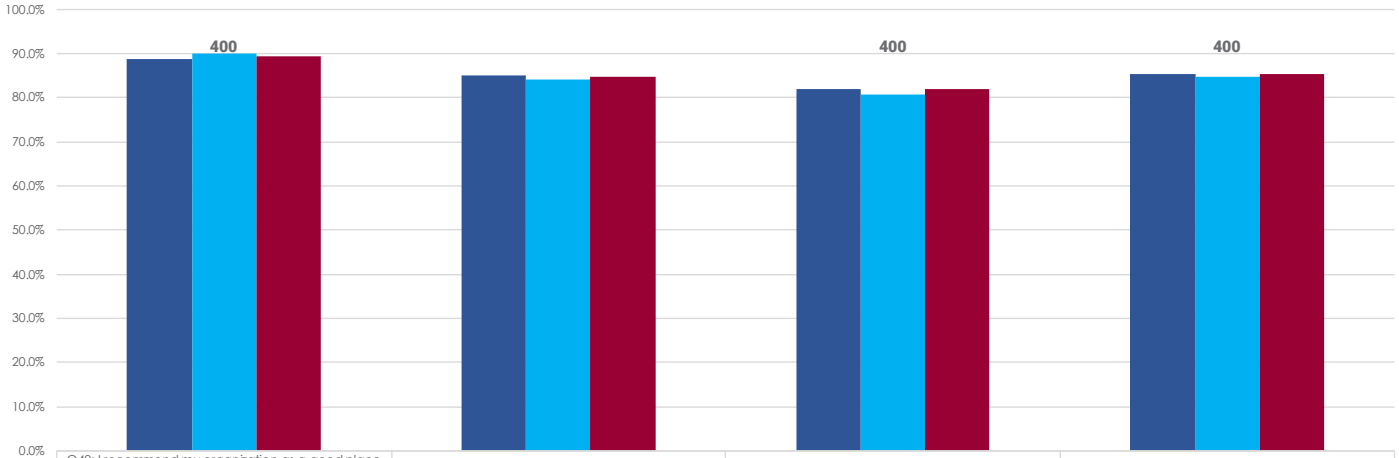
On an annual basis, the Office of Personnel Management (OPM) administers the Employee Viewpoint Survey (EVS) to all permanent Federal employees. This survey tool gathers opinions from employees on all aspects of their employment experience – from satisfaction with their job and agency, to views on their senior leaders, managers, and immediate supervisors. These results help to drive organizational change.

While Goddard's overall response rate decreased 3.8%, the Flight Projects Directorate's (FPD) overall response rate increased 3.7% from 2018 to 2019.

2019 Federal Employee Viewpoint Survey Response Rates

			2019 Response Rates			2018 Response Rates			Change
Agency & Subagency Name	Dir	Org	Number of Surveys Administered	Number of Completed Surveys	Response Rate	Number of Surveys Administered	Number of Completed Surveys	Response Rate	2018 - 2019
Governmentwide	Fed. Gov't.	Fed. Gov't.	1,443,152	615,395	42.6%	1,473,870	598,003	40.6%	↑ 2.1%
Large Agencies (10,000-74,999 employees)	Large Agencies	Large Agencies	281,411	147,472	52.4%	291,872	147,509	50.5%	↑ 1.9%
National Aeronautics and Space Administration	NASA	NASA	16,778	10,789	64.3%	16,974	11,568	68.2%	↓ -3.8%
Goddard Space Flight Center	**GSFC**	**GSFC**	**3,097**	**1,966**	**63.5%**	3,162	1,983	62.7%	↑ 0.8%
FLIGHT PROJECTS DIRECTORATE	**Code 400**	**Code 400**	**248**	**166**	**66.9%**	**394**	**249**	**63.2%**	↑ 3.7%
FLIGHT PROJECTS DIRECTORATE (FO)	Code 400	Code 400 (FO)	13	11	84.6%	12	10	83.3%	↑ 1.3%
RESOURCE ANALYSIS OFFICE	Code 400	Code 405	17	15	88.2%	17	13	76.5%	↑ 11.8%
EARTH SCIENCE PROJECTS DIVISION	Code 400	Code 420	32	25	78.1%	67	45	67.2%	↑ 11.0%
EXPLORATION & SPACE COMM PROJ DIV	Code 400	Code 450	50	30	60.0%	73	51	69.9%	↓ -9.9%
JOINT POLAR SATELLITE SYSTEM PROGRAM	Code 400	Code 470	15	11	73.3%	35	20	57.1%	↑ 16.2%
INSTRUMENT PROJECTS DIVISION	Code 400	Code 490	17	14	82.4%	39	30	76.9%	↑ 5.4%

GSFC Best Places to Work Index Trends (2017-2019)



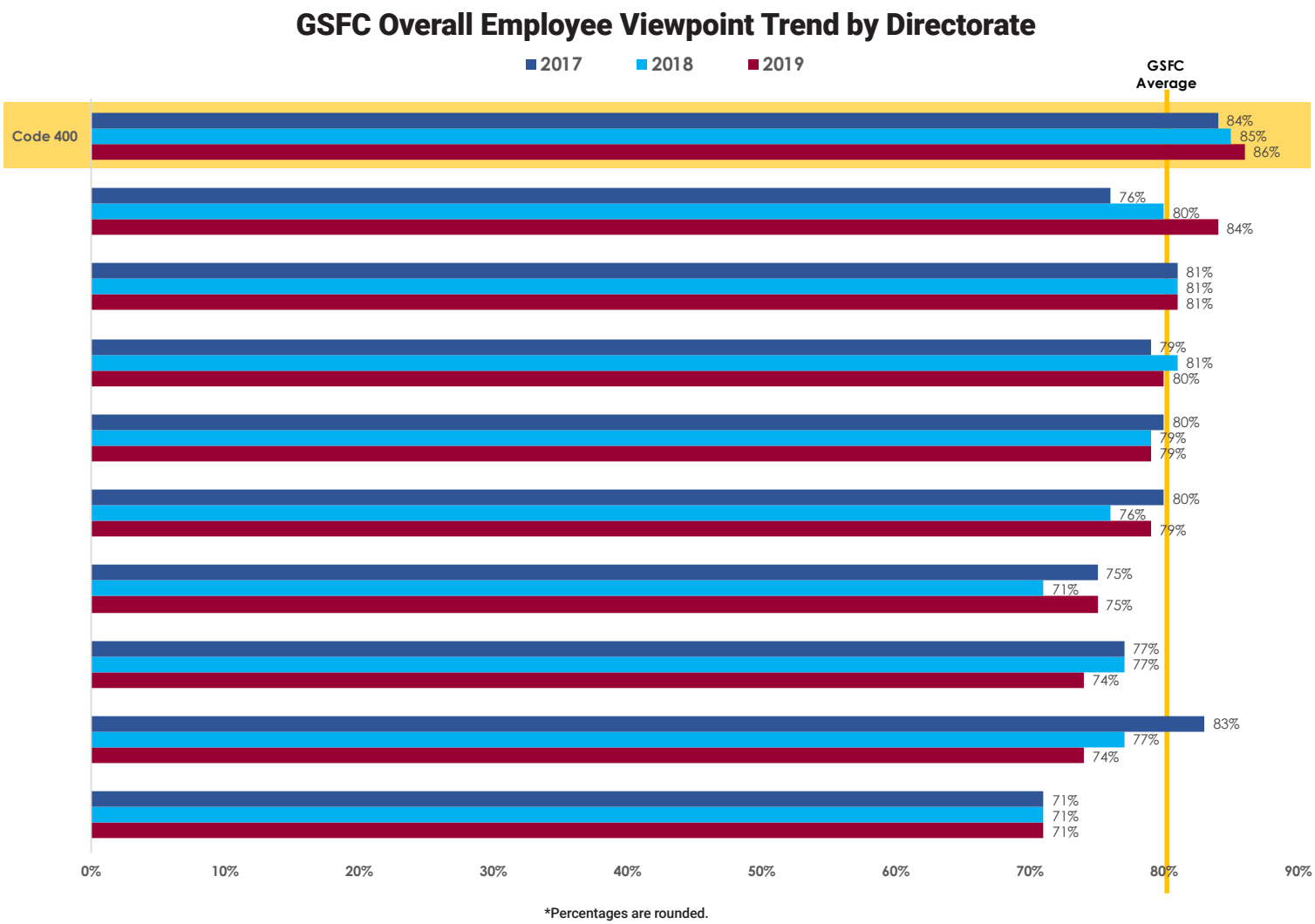
	Q40: I recommend my organization as a good place to work	Q69: How satisfied are you with your job?	Q71: How satisifed are you with your organization?	Overall Average
2019	88.9%	85.2%	81.9%	85.3%
2018	89.9%	84.2%	80.6%	84.9%
2017	89.5%	84.8%	82.0%	85.4%

Best Place to Work (3 questions) -- Measures the overall performance of agencies and agencies subcomponents related to employee satisfaction and commitment.

FPD led in 3 of 4 areas in the GSFC Best Places to Work Index Trends from 2017-2019

On November 4, the 2019 EVS results were released and the Flight Projects Directorate did very well. FPD's overall scores are higher than the NASA average and we again improved our EVS scores from the past year for the third year in a row. In 2019, FPD led GSFC with the highest average EVS score of 86%. In addition to the highest scores in 3 of 4 areas in the Best Places to Work index, FPD led scores in 4 of 6 in the new IQ (Inclusion Quotient, led in 3 of 4 areas in the employee engagement index, and led in 5 of 5 areas in the effective leadership index trends! Great job, Flight Projects Directorate!

Our next steps will be to create individual reports to projects/offices/divisions that have 10 or more responses and EVS debriefs will occur in January 2020.



*Percentages are rounded.

Thank you to all who responded to the EVS!

Continued on page 32

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Congratulations to the Resource Analysis Office (Code 405) who had the highest response rate across the FPD with 88%! They increased their response rate by 11.8% from 2018 to 2019!

FPD senior management treated Code 405's civil servants to an Ice Cream Social to thank them for their outstanding effort.

Dave, Tom, and Wanda served as the "scoopers". CREDIT: ALL PHOTOS COURTESY OF DONNA SWANN

Kudos to two other divisions who increased their response rates by double digits from 2018 to 2019

Joint Polar Satellite System Program (Code 470), +16.2%

Earth Science Project Division (Code 420), +11.0%

Farewell George

George Morrow will retire from Goddard on December 31, 2019 as the Acting Center Director, a role he assumed on August 1, 2019, following the departure of Goddard Director, Chris Scolese. George also continued his duties as GSFC Deputy Director, serving in that role since April 2015.

George received the Presidential Rank Award of Meritorious Executive in both 2007 and 2014. He was awarded the NASA Exceptional Service Medal in 1994 and the NASA Outstanding Leadership Medal in 2006. He received the Goddard Robert C. Baumann Award for Mission Success in 2015. He is also the recipient of numerous other NASA and Goddard Group Achievement and Special Act awards.

George began his career at Goddard in 1983 and served in various increasingly responsible systems engineering and management positions before being named deputy project manager of the Hubble Space Telescope (HST) Flight Systems and Servicing Project in 1994 and then the Deputy Associate Director of Flight Projects for HST in 1997. In January 1998, Morrow was assigned as the Earth Observing System (EOS) PM (later named Aqua) project manager.

> "I often wonder how I got the good fortune of getting involved in something so incredible …"

In February 2001, George left government service to become the Vice President and Division Manager of the Aerospace Engineering Division at Jackson and Tull. He returned to Goddard in March 2003 as the Deputy Director of Flight Projects but served until April 2004 as the Acting Associate Director of Flight Programs and Projects for EOS.

George holds the distinction of being the longest-serving Director of Flight Projects. During his 8-year tenure, he was responsible for the day-to-day management of the more than 40 Space and Earth Science missions in formulation, implementation, or operation at Goddard as well as management of the Earth Science Technology Office and the Advanced Concepts and Technology Office. His friends and colleagues in The Flight Projects Directorate, along with the entire Goddard Space Flight Center, are grateful to George for his many years of dedication, vision, and leadership and wish him the very best in his future endeavors.

George shared some insights into his long Goddard career at a recent Masters Forum; see page 40.

WHAT'S UP WITH FPDP COHORT #3?

Flight Projects Development Program

FPDP Workshop #3 attendees. CREDIT: WALT FAULCONER

The Flight Projects Development Program (FPDP) is a rigorous, two-year program designed to develop highly skilled flight project management personnel through an accelerated learning and development curriculum. Participants complete required and elective coursework, attend various developmental opportunities, receive comprehensive mentoring, complete two specially selected work assignments, and develop a Capstone Project.

After a busy summer working on their capstone project and continuing with coursework and training, Cohort #3 participants have transitioned into their second work assignments. The FPDP Governance Board, currently chaired by Dave Mitchell (Director, Flight Projects Directorate), reviewed and approved the work assignments. The Cohort's second assignments were chosen to fill identified gaps, enhance the participant's understanding of flight project management, and provide hands-on, real-world experiences. The participants are currently serving in the following positions:

Ben Hall

Financial Manager, Geostationary Operational Environmental Satellites – R Series (GOES-R) Ground/Flight

Joe Stevens

Deputy Instrument Manager for Bench Checkout Equipment, Ocean Color Instrument (OCI)

Cathy Stickland

Financial Manager/Ground Business Lead for Cloud Architectural Studies, Joint Polar Satellite System (JPSS) Ground

Jesse Walsh

Deputy Manager, SPIDER

The FPDP hosted Workshop #3, focusing on the politics of project management (also known as "Political Engineering"), on October 29-31 in Washington, DC. In addition to Cohort #3, there were over 45 representatives from other centers in attendance. Holding the workshop on Capitol Hill allowed for an impressive list of key NASA and government and industry leaders, as well as subject matter experts, to give attendees insights into how "Washington" operates and how to navigate the budget and policy landscapes with political savviness. Attendees learned about not only working with NASA Headquarters, Congress, and the White House on the budget process, but also how the political process could impact the accomplishment of a project (e.g., shutdown, continuing resolution, budget cuts, project cancellations, changes in strategic goals, etc.). Speakers also provided information on how the process works and how to deal with many political factors outside of their control.



(left to right) Cathy Stickland, Joe Stevens, and Ben Hall leading project management break-out sessions at the workshop. CREDIT: WALT FAULCONER

Workshop #3 speakers included:

Bill Adkins, *Professional Staff*, U.S. House of Representatives Committee on Appropriations

Dennis Andrucyk, *Deputy Associate Administrator*, NASA's Science Mission Directorate (SMD)

Jeff Bingham, *Staff*, U.S. Senate Committee on Commerce, Science and Transportation (ret)

Sam Black, *Program Examiner*, Office of Management and Budget - Science and Space Branch

Brandon Eden, *Manager - Washington Operations*, United Launch Alliance

Debra Facktor, *Vice President and General Manager - Strategic Operations*, Ball Aerospace

Mike Griffin, *Under Secretary of Defense for Research and Engineering*, Department of Defense; former *Administrator*, NASA

Tom Hammond, *Staff Director*, U.S. House Committee on Science, Space & Technology

Congresswoman **Kendra S. Horn**, OK 5th District (D), U.S. House Science, Space & Technology Committee - Subcommittee on Space & Aeronautics (*Chair*)

Carol Lane, *President*, American Astronautical Society

Todd May, *Senior Vice President of Space Strategy – Systems Analysis & Services Division*, KBR, Inc.; former Director, NASA's Marshall Space Flight Center

James Morhard, *Deputy Administrator*, NASA

John Olson, *Vice President and General Manager - Commercial*, Government & Defense, Polaris Industries

Scott Pace, *Executive Director*, National Space Council

Larry Paxton, *Chief Scientist for Heliophysics*, Johns Hopkins University Applied Physics Laboratory

Congressman **Bill Posey**, FL 8th District (R), U.S. House Science, Space & Technology Committee - Subcommittee on Space & Aeronautics

Jeremy Weirich, *Vice President - Corporate Strategy*, Aura; former Subcommittee Staff Director, U.S. Senate Committee on Appropriations

Ann Zulkosky, *Director of NASA Programs*, Lockheed Martin

Donna Swann / Code 400
Cohort #3 FPDP Program Manager, FPD Assistant Director

(left to right) Donna Swann (FPDP program manager), James Morhard (NASA's Deputy Administrator), and FPDP participants Joe Stevens, Cathy Stickland, and Ben Hall. CREDIT: WALT FAULCONER

We're recruiting!

Cohort #4 will begin in April 2020.
Be on the lookout for the competitive advertisement coming soon!

For more information about the FPDP, please contact Donna Swann at:

donna.j.swann@nasa.gov

Barb Haskell

Flight Projects Directorate (Code 400)

Resources Management Officer

Barb Haskell is currently the Resources Management Officer for the Flight Projects Directorate (FPD). She is responsible for the day-to-day business operations of the Directorate Office and supports Dave Mitchell, Tom McCarthy, and Wanda Peters.

Life Before Goddard

There wasn't much life before Goddard for Barb since she started working here at the young age of 16! She grew up in Seabrook and then Millersville, Maryland and never imagined that she would work at NASA. Having lived right in Seabrook until 8th grade, Goddard was something she drove past often.

Life at Goddard

When Barb interviewed for the Cooperative Office Education (COE) program as a junior at Old Mill High School, she finally got to go inside the gates that she had driven past so many times in her childhood. She started her career here at Goddard on the first day of school in 1980 as a secretarial trainee (GS-1). Her mentor was Donna Mudd who retired from Code 420 only a few years ago. Barb started out in the Networks Directorate in the Tracking and Data Relay Satellite (TDRS) System Management Office with an IBM Selectric typewriter, a date stamp, and a stack of mail to log and distribute. Timecards were kept on a punch card, secretaries fetched coffee and made lunches, and people were allowed to smoke in their offices. To say things have changed is an understatement. Throughout her career, Barb has been a civil servant, a contractor, and a civil servant again. After working in various Networking offices, she has worked on the TDRS project, Earth Observing System (EOS) project, Geostationary Operational Environmental Satellite (GOES) I-M and N-P, Earth Science Data and Information System (ESDIS), Joint Polar Satellite System (JPSS), Total and Spectral Solar Irradiance Sensor (TSIS), and now the FPD Business Management Office (which became part of the Office of the Chief Financial Officer /Code 150 in October 2018). Her career path has taken her from being a secretary to configuration management, information technology, and finally to resources management. She enjoys interacting with people in the Directorate and also across the Center.

Life Outside Goddard

Barb and her husband, Jim, have been married for 36 years and have three children (Daniel, Stephanie, and Brett) and four grandchildren (Hunter, Austin, Blake, and Adalyn). Having all that, most people would be satisfied with their life. But Barb has a creative side that she developed into two successful businesses. In 1993, she opened the Dance Academy of Severna Park and would work all day and teach dance at night. In looking for a way to have students be more invested in their ballet classes and not just jazz and hip hop, Barb started staging full-length ballets as part of the annual dance recital. These ballet productions were so popular that she then started the Chesapeake Ballet Company, which is strictly a performance company. The Chesapeake Ballet Company gives young dancers the opportunity to dance all the roles in major ballet productions. This is very unique because most companies bring in professionals to dance major roles. Students now come from the surrounding counties to participate

Scenes from the Chesapeake Ballet's production of "The Nutcracker." CREDIT: ALL PHOTOS COURTESY OF BARB HASKELL

in two productions each year. In December, the company has ten performances of "The Nutcracker" with a cast of 80 dancers. Each spring, the company performs a storybook ballet such as Sleeping Beauty, Cinderella, and Snow White. These productions are fully-staged and beautifully costumed and not what you would expect from a group of young dancers. Barb owns two shipping containers to house all of the sets and props for each production as well as three large rooms full of costumes. It's very exciting to have students join the company at age 6 or 7 and continue until they graduate from high school. Some dancers have continued their dance studies in college and are working dancers in New York, or dance teachers in the county school systems. This summer, one of the Company's dancers was invited to study abroad at the Bolshoi Academy in Moscow.

In 2007, Barb sold the Dance Academy of Severna Park and now just owns the Chesapeake Ballet Company. The Company holds six company classes for all the various ages and levels of dancers and 3 hours of rehearsals every Saturday. From September through May, Barb can be found every Saturday in the dance studio where she has three employees to teach the classes and help with rehearsals, and many volunteer parents to help with costuming, prop building, and anything else that needs to be done. Many of the volunteers continue to help with each production even when their dancers have graduated because they truly believe in the mission of the Company.

When she isn't in the dance studio, she loves to sail in the Caribbean, boat on the Chesapeake Bay, and always has time to spend time with her grandbabies.

If you would like to come to see a performance of "The Nutcracker," tickets can be purchased at www.chesapeakeballetcompany.com ■

Rosa Avalos-Warren

Network Integration and Management Office (Code 450.1)

Human Space Flight Mission Manager

Born Lima, Peru

Education Master in Mechanical Engineering, Rice University, Houston
B.S. Aerospace Engineering, Virginia Tech, Blacksburg

Life Before Goddard

Rosa was born in Peru and she grew up in two small, poor villages. She helped with her grandmother's fig farm, and she helped her uncles with the finances of their local brick-making company.

Despite her humble beginnings Rosa later moved to the United States, with her family, at the age of twelve. Her love for math and science took her to Virginia Tech where she would earn her Bachelors degree in Aerospace Engineering. Becoming an aerospace engineer is a dream Rosa formed when she first watched the Space Shuttle Columbia launch on television.

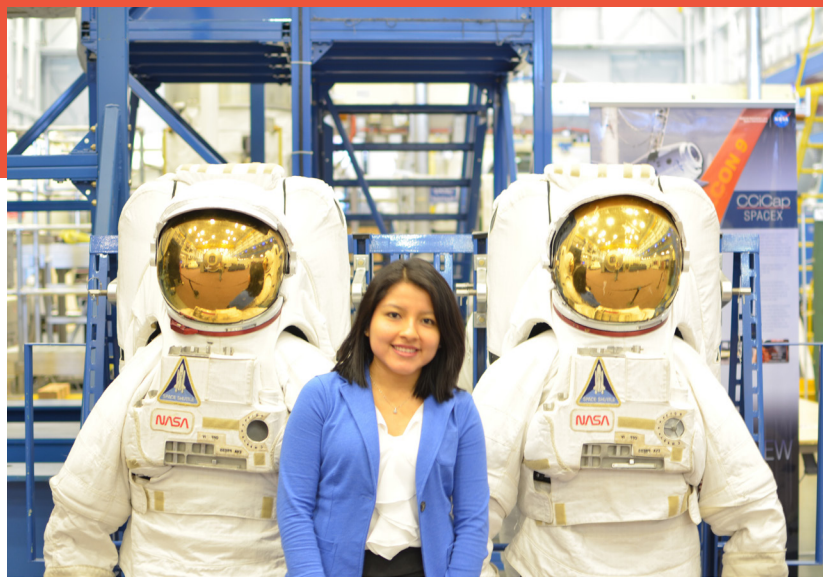
During her time at Virginia Tech, Rosa did research with professors and professionals from NASA Langley – Rosa's contributions were published at the 9th American Institute of Aeronautics and Astronautics (AIAA) conference.

Prior to moving back to the East Coast, Rosa was employed by the Boeing Company working for NASA's International Space Station (ISS) program in Houston, Texas. During her employment there, Rosa held a multitude of different engineering roles such as mechanical and operations engineer, systems engineer, payload topology engineer, passive thermal control systems (PTCS) engineer, and payload integration manager. Throughout these roles she actively worked at Johnson Space Center's Mission Control Center (MCC) Mission Evaluation Room (MER) during dynamic operations. The highlight of Rosa's work with the ISS program was working as a mechanical subsystem lead for the ISS Roll-Out Solar Array (iROSA).

Life at Goddard

Rosa worked at Goddard's Wallops Flight Facility as a project manager (PM). One of Rosa's chief contributions here was her PM role on the Human Exploration and Operation (HEO) Air Surveillance effort where she oversaw multi-million-dollar effort with various contractors to enhance the air surveillance capabilities for the range. She also worked on the formulation of Rocket Lab launches.

Rosa accepted her position as a Human Space Flight Mission Manager Communications and



Rosa has had a wide experience of work at NASA / Rosa and husband Alex with Camila Valentina. CREDIT: ALL PHOTOS COURTESY OF ROSA AVALOS-WARREN

Tracking Network (CTN) at the beginning of 2019 where she is now overseeing the network aspects of missions for the ISS program and the Commercial Crew Program (CCP) and Artemis. Rosa is very passionate about human space exploration and NASA. She enjoys the challenges that are presented to her given that communications is a new field of expertise for her.

Life Outside Goddard

Rosa lives in Northern Virginia with her husband Alex and her 4-month old daughter, Camila Valentina. Besides embracing being a new mother, Rosa is an advocate of Science Technology Engineering and Mathematics (STEM) and is a TEDx speaker. She also enjoys talking to students both in the US and internationally to inspire the students to pursue higher education and STEM. Rosa has partnered with the US Department of State for outreach programs in Peru, Mexico, and Malta. ■

> "What everyone in the astronaut corps shares in common is not gender or ethnic background, but motivation, perseverance, and desire—the desire to participate in a voyage of discovery."
>
> – Ellen Ochoa

Watch the video

Hear Rosa explain her work at GSFC and the FPD in this video in Spanish

https://www.youtube.com/watch?v=8l78SA3Vi1k

An Interview with George Morrow

By Dan Blackwood of GSFC's Flight Projects Directorate for the recent Goddard Masters Forum

George Morrow's career at Goddard Space Flight Center (GSFC) began by chance and perhaps a bit of luck. One of his professors at the University of Virginia announced an opening at Goddard in the Space Power Operations Branch. George applied, was offered the job, and arrived at Goddard in 1983 with a freshly minted BS in chemical engineering. Thirty-six years later, including two-years in the private sector, George Morrow will be retiring from NASA's GSFC this month.

George Morrow was interviewed by Dan Blackwood of GSFC's Flight Projects Directorate for the recent Goddard Masters Forum. Following is a portion of that discussion.

How was NASA different in 1983 than it is today?

There were no computers, no e-mail, and no iPhones. How could anything possibly have gotten done? Yet NASA and other technologically advanced organizations did in fact, get things done. The first computer I had at Goddard was a Fat Mac which I used for plotting and making graphs.

While email and text messaging are useful, misunderstandings may occur that may not be immediately apparent. An actual conversation offers greater bandwidth. I recommend picking up the phone or getting everyone in the same room. It is not a panacea though. I have noticed later in my career that people may talk past each other rather than have constructive conversations.

What opportunities do you wish employees would take advantage of to understand the whole system?

I tell early career folks that no one cares about your career and its progression more than you do. You need to do a great job in your current role. Be aware of what is going on around you - your projects, your Directorate, the Center. Opportunities are always becoming available. Stay in touch with colleagues – expand your contacts; this is where your next opportunity may spring from.

What makes a good project manager?

GSFC project managers typically are engineers or hold a technical degree. To be an effective project manager, both technical and business skills are necessary. The strongest project managers own the whole project and understand the budgets, the analysis, the puts and takes, etc. Conversely, a PM does not always have to be a technical person. A business person with the right makeup and a serious interest in the technical side can become an effective project manager.

What recurring themes have been escalated to your level?

I noticed a theme during my career around failures; in development, an anomaly, a mishap or a failure once something has launched and is in orbit. More often than not those things happened because someone made a mistake somewhere that was not caught. In my view, a lot of those mistakes happened because people were not fully engaged in the job they were doing.

As Deputy Director of the Center, one of my responsibilities is to be the champion for Diversity and Inclusion (D&I). We had a D&I retreat several weeks ago with the theme of belonging. This ties into engagement. In order to be fully engaged in the jobs they are doing, people need to feel they belong in the organization. Everything we can do to make people feel comfortable, belonging to and engaged in the organization is time well spent.

Are there other project pitfalls that you would like to mention?

With engineers, you will not hear 'it cannot be done.' They want to get the project funded, approved, and through KDP-C. There is an optimism bias as the system tends to reward the lowest cost and most

favorable schedule. Questioning optimism is not rewarded early in the process. This is why joint confidence level and independent estimates are helpful.

Steve Shinn, working with the Aerospace Corporation, performed a review of GSFC projects and performance. The good news is that over the last eight years, GSFC has been performing well in terms of performance against commitments, with a few exceptions.

Learning from innovative organizations external to NASA is important. Are there any that you have been paying particular attention to?

Rocket companies such as SpaceX, Blue Origin, and Sierra Nevada are using iterative models to progress their designs. They are not afraid to fail, to learn from those failures, and to build upon them. NASA is approaching Artemis in a way that is more aligned to that approach. There are risks – you have to be willing to accept things failing. I do not believe that we, as an Agency, can embrace this model in its entirety, yet there is a lot we can learn from it.

You are pretty busy right now, filling two jobs. If time was not an issue, are there ideas or things you would spend more time on?

Much is going on at NASA, such as the Mission Support Future Architecture Program, which means there will be a different way of doing business. As a result, we have had to be more reactive than I would have liked. Being able to spend more time on strategic thinking and charting a path forward as we evolve, would be my priority.

What does the GSFC Director need from Flight Projects?

Develop a realistic plan and perform to it. Do not wait to communicate issues or hold back information until everything is known about the problem. Sometimes, management can engage with externals or help in a way that will stop so much upfront wheel spinning.

What is the state of GSFC's relationship with NASA Headquarters (HQ)?

I have a different perspective of NASA Headquarters than most employees. The relationship is the same, not more positive or negative than it has been.

Some folks in leadership roles do not like to be surprised. When they communicate this to their staff the resulting engagement with projects may be perceived as micro-managing. This can lead to requirements creep in reviews and reporting out from reviews. For example, there is no Key Decision Point following a Critical Design Review (CDR), yet Program Management Council call-outs are being scheduled post-CDR. Many hours of work are needed to prepare for these presentations including dry runs with staff. I have been trying to address this. I have asked 'what is the real point of this?' For example, what will be gained that did not come from the one-page brief by the standing review board chair at the end of CDR?

There needs to be a healthy tension on both sides – we need to throw the flag when we see something that is not in the best interest of the program. Headquarters experiences pushes and pulls which we need to understand as well.

What is next for you?

I made the decision to retire at the end of the year. It was not an easy decision. I want to work full-time for a few more years. I had to decide if I wanted to do something similar to what I have been doing or to experience something new and different. I opted for the latter. The hardest part of this decision is knowing that I will not be working with my colleagues or contributing directly to the GSFC mission.

What are you most proud of in your time here at Goddard?

I am proud of having worked for this great organization for over 36 years and in some way, contributing to its success. I was fortunate in having had the opportunity to work on missions that made significant contributions to science.

Do you have any goals for GSFC that are still not done, that you hope will continue?

The organization is on a great path. Goddard is well aligned to the most prominent Agency mission which is to the land the first woman and next man on the moon, and then on to Mars. We will contribute to this mission in the areas of science, communications, space weather, and astronaut training. The 2021 launch of the James Webb Space Telescope (JWST) is of great importance. I look forward to seeing the contributions JWST makes to astrophysics, much like Hubble did before it. ■

Judy Dickinson / Code 400
FPD Knowledge Management Lead

AGENCY HONOR AWARDS

Code 400 Awardees

The Agency Honor Awards Ceremony took place on September 5, 2019. Noted are awards to Code 400.

Kevin K. Carmack

★ OUTSTANDING LEADERSHIP MEDAL ★

For exceptional leadership of the Laser Communications Relay Demonstration project, reaching major milestones on a high-profile and complex mission.

Jamie L. Dunn

★ OUTSTANDING LEADERSHIP MEDAL ★

For outstanding leadership of the Global Geostationary Weather Satellite (GOES)-S/17 Advanced Baseline Imager performance recovery.

Mark D. Goans

★ OUTSTANDING LEADERSHIP MEDAL ★

For excellent technical and managerial leadership on the Parker Solar Probe mission, bridging the gap between NASA and APL.

Daniel Lindsey

★ OUTSTANDING LEADERSHIP MEDAL ★

For outstanding leadership of the GOES-S/17 ABI science options team that provided critical science and user support for the recovery of the Key Performa.

Arindam Mallik

★ OUTSTANDING LEADERSHIP MEDAL ★

For expert leadership of the Human Space Flight Network, which has enabled constant communications support to high-profile missions such as ISS.

Douglas D. McLennan

★ OUTSTANDING LEADERSHIP MEDAL ★

For substantial contributions to the success of NASA's Ice, Cloud and land Elevation Satellite (ICESat)-2 mission and the achievements of the ICESat-2 project team.

Vickie E. Moran

★ OUTSTANDING LEADERSHIP MEDAL ★

For outstanding leadership of the Transiting Exoplanet Survey Satellite (TESS) project.

James T. Pontius

★ OUTSTANDING LEADERSHIP MEDAL ★

For Outstanding Leadership as Project Manager of the Global Ecosystem Dynamics Investigation (GEDI) Lidar, overcoming every obstacle and delivering ahead of schedule.

Continued on page 44

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Kenneth O. Schwer

★ OUTSTANDING LEADERSHIP MEDAL ★

For outstanding leadership of the Instrument Projects Division (IPD) in-house instrument development.

Ted C. Sobchak

★ OUTSTANDING LEADERSHIP MEDAL ★

For attention to detail, forward-looking mindset, and ability to build a productive and cohesive team environment.

Pamela C. Sullivan

★ OUTSTANDING LEADERSHIP MEDAL ★

For exceptional leadership and significant contributions to development and operations of GOES-R and GOES-S, the world's premier weather satellite constellation.

Jeffrey F. Volosin

★ OUTSTANDING LEADERSHIP MEDAL ★

For excellent technical and managerial leadership of the TESS mission, leading it to a successful launch on April 18, 2018.

Mark F. Voyton

★ OUTSTANDING LEADERSHIP MEDAL ★

For your outstanding leadership that unified multiple teams and provided a clear vision to solving technical issues resulting in James Webb Space Telescope (JWST)'s successful spacecraft vibration test

Timothy J. Walsh

★ OUTSTANDING LEADERSHIP MEDAL ★

For exemplary leadership of GOES-R program team in transitioning its first satellite into operational service and launching its second satellite.

Daniel Linebarger

★ OUTSTANDING PUBLIC LEADERSHIP MEDAL ★

For over two decades of exceptional spacecraft operational leadership on some of NASA's largest missions.

Edward L. Shade

★ OUTSTANDING PUBLIC LEADERSHIP MEDAL ★

For sustained leadership spanning 5 years to deliver JWST's Optical Telescope Element / Integrated Science Instrument Module (OTIS) flight hardware through its vital cryo-vacuum test at JSC to meet major mission milestones.

Thomas A. Gitlin

★ EXCEPTIONAL SERVICE MEDAL ★

For exceptional contributions to more than 40 National Aeronautics and Space Administration (NASA) missions.

Michael M. Little

★ EXCEPTIONAL SERVICE MEDAL ★

For significant service and creativity in leading the Advanced Information Systems Technology (AIST) Program, improving its relevance to, and responsiveness, with its stakeholders.

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Robert J. Menrad

★ EXCEPTIONAL SERVICE MEDAL ★

For exemplary leadership, dedication, and vision that directly contributes to the continued success of numerous agency missions.

Cathleen M. Richardson

★ EXCEPTIONAL SERVICE MEDAL ★

For sustained performance in improving Earth Systematic Mission Program performance and implementing a number of process improvements across the program.

Jahi O. Wartts

★ EXCEPTIONAL SERVICE MEDAL ★

For outstanding personal commitment to mission success, high degree of integrity, solution-oriented approach, and demonstrated excellence.

Greg Berthiaume

★ EXCEPTIONAL PUBLIC SERVICE MEDAL ★

For Successful Leadership of the TESS Instrument.

DeLee I. Smith

★ EXCEPTIONAL PUBLIC SERVICE MEDAL ★

For outstanding efforts in website design and public outreach and dedication to Explorers and Heliophysics Projects Division (EHPD) and the Agency.

Taylor M. Hale

★ EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL ★

For exceptional technical engineering of the GEDI instrument during development, integration, environmental testing, and on-orbit commissioning.

Diane Lambert

★ EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL ★

For exceptional engineering achievement in overseeing the requirements, development and test of the Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) "J-Asteroid" science planning software.

Jason M. Leonard

★ EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL ★

For exceptional leadership and innovation in modeling the OSIRIS-REx spacecraft orbit dynamics, leading to unprecedented navigation performance at near-Earth asteroid Bennu.

Eric Marquardt

★ EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL ★

For exceptional engineering achievements as the Thermal Infrared Sensor-2 (TIRS-2) cryocooler expert engineer.

William J. Pisano

★ EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL ★

For extraordinarily innovative contributions to extending Mars Atmosphere and Volatile Evolution (MAVEN) mission capabilities resulting in substantial return to NASA's Mars Program.

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John P. Van Naarden

★ EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL ★

For exceptional application of engineering expertise in the recovery of the GOES-17 Advanced Baseline Imager radiometric performance.

Daniel Wibben

★ EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL ★

For the design and successful implementation of the historic orbit insertion of the OSIRIS-REx spacecraft about near-Earth asteroid Bennu.

Alicia R. Jose

★ EXCEPTIONAL ADMINISTRATIVE ACHIEVEMENT MEDAL ★

In recognition of your expertise, remarkable customer support, and exemplary performance that keep the daily operations of the Flight Projects Directorate running smoothly.

Jennifer L. Poston

★ EXCEPTIONAL ADMINISTRATIVE ACHIEVEMENT MEDAL ★

In recognition of your commitment to the success, high integrity, solution-oriented approach, and demonstrated excellence in support of NASA Goddard Space Flight Center.

Eugene D. Guerrero-Martin

★ EXCEPTIONAL ACHIEVEMENT MEDAL ★

For exceptional leadership of the Polar Operational Environmental Satellite (POES)/ Meteorological Operational (MetOp)-C project team through its successful launch and your dedication to NASA's international partners.

Kendall D. Mauldin

★ EXCEPTIONAL ACHIEVEMENT MEDAL ★

For leadership of the Wide Field Infrared Survey Telescope (WFIRST) Optical Communications Feasibility Study to facilitate the use of optical communications by Agency missions for enhanced science results.

Virendra Thanvi

★ EXCEPTIONAL ACHIEVEMENT MEDAL ★

For leadership, commitment, and dedication to system engineering, customer service, and collaboration for Space Network Ground Segment Sustainment (SGSS) project revitalization and mission success.

Keith D. Walyus

★ EXCEPTIONAL ACHIEVEMENT MEDAL ★

For exceptional management of GEDI instrument systems and subsystems throughout development, integration, environmental testing, and in orbit commissioning.

Sandra Freund Kasper

★ EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL ★

For sustained excellence in leading the OSIRIS-REx Mission Support Area mission operations.

David A. Jeyasunder

★ EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL ★

For outstanding technical support to the Transiting Exoplanet Survey Satellite mission.

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Robert A. Luetgens

★ EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL ★

For establishing and strengthening vital partnerships between NASA and its many collaborative teams to deliver JWST's OTIS hardware to its next level of integration.

Kathy L. Strickler

★ EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL ★

In recognition of your boundless agility, balance, creativity, dedication, integrity, respect, and teamwork in support of the ICESat-2 mission.

Lynn V. Westine

★ EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL ★

For outstanding dedication and commitment to excellence through the delivery of mission critical support for the ICESat-2 Advanced Topographic Laser Altimeter System (ATLAS) project.

Sean W. Conover

★ EARLY CAREER PUBLIC ACHIEVEMENT MEDAL ★

For extraordinary work ethic, his ability to learn quickly, and improve processes has increased efficiencies for the Agency's Space Network.

Tara N. Dulaney Ritsko

★ EARLY CAREER PUBLIC ACHIEVEMENT MEDAL ★

For exceptional achievements in project management for the Exploration and Space Communications projects division.

Anthony W. Foster

★ SILVER ACHIEVEMENT MEDAL ★

For engineering excellence in the development and commercialization of a second generation beacon for worldwide emergency distress location.

Vincent S. Galbraith

★ SILVER ACHIEVEMENT MEDAL ★

For significant leadership and technical expertise, enabling secure and efficient spectrum allocation for transmitting science data from spacecraft to user.

Michael A. Kurtz

★ SILVER ACHIEVEMENT MEDAL ★

For ten years of sustained and superior dedication to deliver James Webb Space Telescope flight hardware to every test facility on the path to launch.

Bryan K. Sizemore

★ SILVER ACHIEVEMENT MEDAL ★

For dedicated IT services for the Exploration and Space Communications projects division, exemplifying excellence and teamwork.

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★ SILVER ACHIEVEMENT MEDAL ★ (Team Award)

ABCs of Exoplanets Team

For excellence in developing communications products to inspire the public to learn about and engage with exoplanets, an important and growing area of scientific exploration.

GEDI Project Team

For delivering the decadal-class GEDI instrument, on budget, ahead of schedule, producing the first high resolution observations of Earth's three-dimensional forest structure.

GOLD Instrument Team

For their outstanding effort and technical expertise, leading to the successful launch of the Global-scale Observations of the Limb and Disk (GOLD) instrument on January 25, 2018.

ICESat-2 Project Team

For stellar achievements in overcoming a number of challenges resulting in the successful launch of the ICESat-2 mission.

OSIRIS-REx Navigation Team

For phenomenal performance and teamwork during the OSIRIS-REx Navigation Campaign, leading to the historic orbit insertion about near-Earth asteroid Bennu.

Parker Solar Probe Team

For the Parker Solar Probe team's outstanding dedication resulting in the successful launch of a record-breaking mission on August 20, 2018.

SCE Sine Vibration Test Team

For the ingenuity and selfless dedication demonstrated to successfully plan and execute a critical vibration test for JWST's spacecraft element.

TESS Project Team

The TESS team overcame many obstacles but through sheer force and determination was able to overcome them all, leading to a successful launch on April 18, 2018.

★ GROUP ACHIEVEMENT MEDAL ★ (Team Award)

Core MOMA-MS ALD Integration & Test Team Members

In recognition of the dedication and esprit de corps of the Mars Organic Molecule Analyser-Mass Spectrometer (MOMA-MS) team's successful completion of the integration and test of the MOMA-MS instrument to the ExoMars Mission.

Disruption Tolerant Networking Project Team

In recognition of the Disruption Tolerant Networking team's ability to create a high-level technology demonstration in under three months.

Hubble Gyro 3 Recovery Team

In recognition of the steadfast determination and technical ingenuity to recover gyro 3 and extend the life of the Hubble Space Telescope.

ICESat-2 Launch and Commissioning

For significant launch and commissioning preparations and achievements enabling the success of the ICESat-2 mission.

ICESat-2 Integration and Test

For significant achievements in the development of innovative integration and test activities that enabled the success of the ICESat-2 mission.

JPSS Fire Response Team

For exceptional group response to an unforeseen crisis ensuring the safety of all personnel and for developing innovative process improvements for potential future crises.

MetOp-C Launch Team

In recognition of technical excellence and outstanding teamwork for the international MetOp-C mission.

OSIRIS-REx Asteroid Approach & Preliminary Survey

For sustained excellence in surmounting unprecedented navigation and science challenges during the OSIRIS-REx Asteroid Bennu Approach and Preliminary Survey Phases.

Robotic Refueling Mission 3 Integration Team

For unparalleled dedication resulting in the successful final testing and launch preparation of Robotic Refueling Mission 3.

RRM 3 Communications and Outreach Team

For exceptional creativity in and dedication to communications and outreach for Robotic Refueling Mission 3.

SCaN Podcast Team

For innovation in digital media storytelling through the creation of NASA's space communications and navigation podcast, "The Invisible Network."

SCaN Visitor Center Exhibit Team

The Space Communications and Navigation (SCaN) Visitor Center exhibit team displayed expert ability in utilizing cross-functional teamwork for an interactive display at the Goddard Visitor Center.

Second Generation Beacon Team

For engineering excellence in the development and commercialization of a second generation beacon for worldwide emergency distress location.

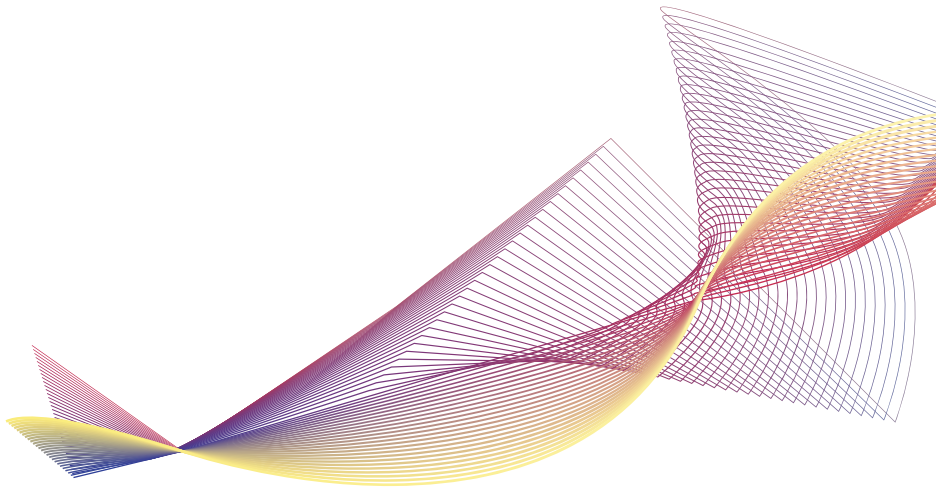
The WFIRST and PACE Common Buy Procurement Team

For the WFIRST and PACE Spacecraft Teams and Directorate partners on achieving the first-ever common buy procurement of its kind resulting in saving NASA millions of dollars.

Honor Awards Program

Find out more about NASA's most prestigious honor awards program

- https://nasapeople.nasa.gov/awards/nasamedals.htm



Coming and Goings

July 1 through September 30, 2019

Comings

Scott Schwinger (590) - Reassigned to 401/Project Formulation & Development Office (PFDO) Deputy Chief

Brandon Bethune (New) - Into 453/ Near Earth Network (NEN) Ka-Band Manager

Julia Ownes (MSFC) - Reassigned to 450/Explorations & Space Communications Division (ESCD) Elements Manager

Goings

Doug Mclennan (425) – Retired

Michael Donnelly (434) – Retired

Jeanine Murphy-Morris (472) – Retired

Myra Bambacus - Transfer to Department of Defense

Christopher J. Ridenour (405) – retired

Reassignments/ Realignments Details within Code 400

Curtis Emerson (453) - Reassigned to 450/Explorations & Space Communications Division (ESCD) Contracting Officer Representative

Beth Keer (481) - Reassigned to 450.2/ Technology Enterprise and Mission Pathfinder Office (TEMPO)

Param Nair (429) - Reassigned to 424/Total and Spectral Solar Irradiance Sensor (TSIS)-2 Instrument Manager

Arlin Bartels (444) - Reassigned to 434/Lucy Deputy Project Manager

Glenn Jackson (493) - Reassigned to 451/Laser Communications Relay Demonstration (LCRD) Observatory Manager

Sridhar Manthripragada (440) - Reassigned to 435/Mars Sample Return (MSR) Capture, Containment, and Re-turn System (CCRS) Project Manager

Robin Krause (450) - Reassigned to 401/PFDO Study Manager

Antonio Seas (451) - Reassigned to 401/PFDO Study Manager

Michael Hill (490) - Reassigned to 401/PFDO Study Manager

Karen Rogers / Code 400
Administrative Officer

OUT & ABOUT

LIFE'S HIGHLIGHTS OFF CAMPUS

Best wishes to Kerri (400) and Tyler Anderson, on the birth of Harrison Reed, born on October 21, 2019, weighing 7 lbs., 15 oz. He is the grandson of Tina Schappell (443).

Congratulations to Terry Hayden (460) and her husband, Tom, on their first grandchild, Kieran Thomas. He was born on October 29, 2019, at 4:02pm, weighing 7 lbs., 10 oz, and was 21 inches long. Proud Mom and Dad are Thomas Joseph (TJ) Hayden, and Sammi McCarty.

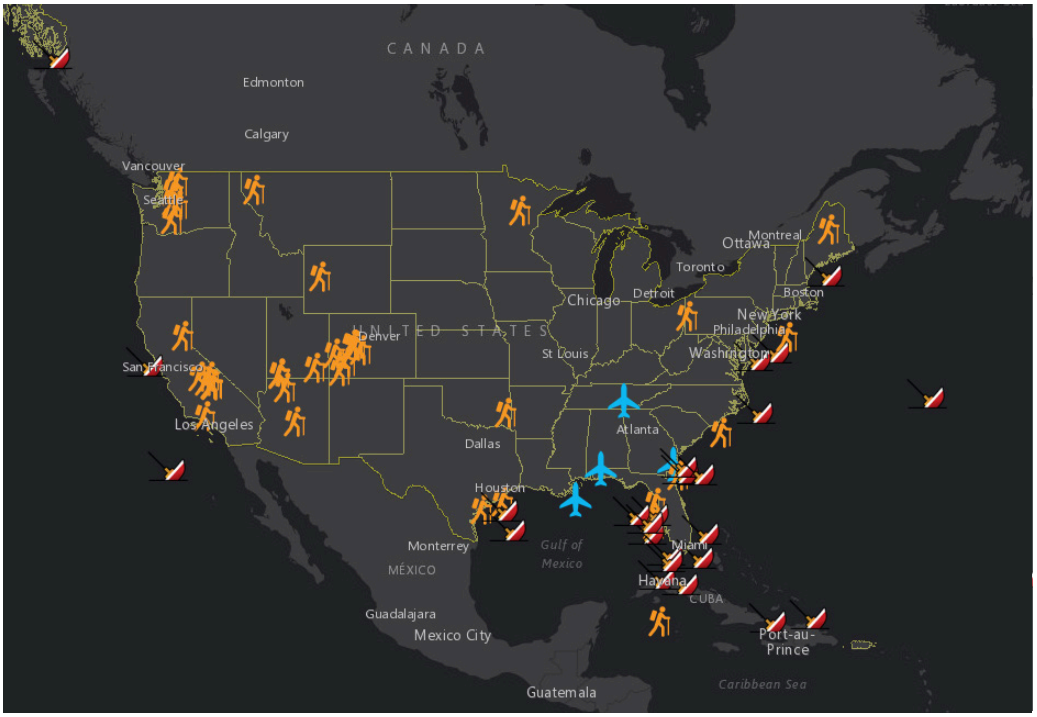
Share your news!
Weddings, births, interesting travel experiences...we want to know!

Please send your inputs to Paula Wood. Include your **name, phone number** to:

paula.l.wood@nasa.gov
Code 460
Ext. 6-9125

THE LATEST SAR SAVES

NASA'S SEARCH AND RESCUE (SAR) OFFICE CONTINUES ITS EFFORTS TO DEVELOP AND IMPROVE ON LIFE-SAVING DISTRESS BEACON TECHNOLOGIES.



Each icon on this map represents one rescue event, though multiple saves may be involved with each event. The Search and Rescue Satellite Aided Tracking (SARSAT) system is able to detect three types of beacons:

Personal Locator Beacons (PLBs)

Used primarily by hikers and outdoor enthusiasts

Emergency Position Indicating Radio Beacons (EPIRBs)

Used by commercial and recreation ships

Emergency Locator Transmitters (ELTs)

Used by civilian aircraft

COSPAS-SARSAT rescues from August 2019 through November 2019 are shown above.

DID YOU KNOW...?

On November 7, 2019, the National POW/MIA Flag Act was signed into law. The new law honors service members who are Prisoners of War (POW) or Missing in Action (MIA) by increasing the frequency of the POW/MIA flag display at Federal properties. New locations for displaying the flag year around include the U.S. Capitol, the White House, the World War II Memorial, the Korean War Veterans Memorial, the Vietnam Veterans Memorial, every national cemetery, the buildings containing the official offices of the Secretaries of State, Defense, and Veterans Affairs, the office of the Director of the Selective Service System, each major military installation, each Department of Veterans Affairs medical center, and each United States Postal Service post office.

We want to be in the know!

If you have something to share, send it to Matthew Ritsko. Include your **name, phone number** and send it to:

matthew.w.ritsko@nasa.gov

Code 400 Diversity and Inclusion Committee

Ext. 6-2515

FPD Service Awards

LENGTH OF SERVICE AWARD

- Bruce Milam
- David Carter
- Gail Dellagatta
- James Jeletic
- John Van Blarcom
- Robert Bauer
- Tommy Jones
- William Potter

LENGTH OF SERVICE AWARD

- Carolyn Mariano
- Eugene Guerrero-Martin
- Kaleem Kawaja
- Kevin Jones
- Michael Donnelly
- Ted Sobchak

LENGTH OF SERVICE AWARD

- Brent Robertson
- Mark McInerney
- Robin Krause
- Vicki Dulski

LENGTH OF SERVICE AWARD

- Arlin Bartels
- John Owusu

LENGTH OF SERVICE AWARD

- Benjamin Reed
- James Pontius
- Kevin Carmack
- Olivia Lupie
- Phuc Nguyen

LENGTH OF SERVICE AWARD

- Andrew Bates
- Angela Conley
- Jerry Mason
- Obadiah Kegege

FLIGHT PROJECTS
LAUNCH SCHEDULE 2019-2020

DECEMBER	FEBRUARY	JULY	NOVEMBER	DECEMBER
				
12/2019 Robotic Tool Stowage (RiTS)	**2/2020** Solar Orbiter Collaboration (SOC)	**7/2020** Mars Organic Molecule Analyzer-Mass Spectrometer (MOMA-MS)	**11/2020** Laser Communications Relay Demonstration (LCRD) - TBC	**12/2020** High Resolution Mid-InfrarEd Spectrometer (HIRMES) - TBC
				
				12/2020 Landsat 9

TBC: To Be Confirmed